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STUDY OF THE IMPACT OF USING
IDTC/REQUIREMENTS
CONTRACTS TO REDUCE THE PROCUREMENT
ADMINISTRATIVE LEAD TIME (PALT) AT THE NAVY
AVIATION SUPPLY OFFICE PHILADELPHIA

by

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An Automated Decision Support System (DSS) was developed to incorporate the essential elements into three models: (1) a Full Model for identifying candidates, (2) a Family Grouping Model for grouping of like items on the same contract, and (3) a PALT Reduction Model for assessing the impact of using requirements contracts.

A test run of the DSS on 12,993 ASO inventory items revealed that the PALT for these items could be reduced by as much as 19% by expanding the use of requirements contracts.

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Lastly, the author dedicates this thesis to his mother (Mrs. Lola Speights) in recognition of her many sacrifices and inspiration, which are the cornerstone of the author's educational achievements.

I. INTRODUCTION

A. BACKGROUND

Following major "horror stories" in the early 1980's dealing with exorbitantly high spare parts pricing and losses of spare parts inventory management integrity, the Congress and the Department of Defense (DOD) took aggressive actions both to reduce spare parts prices and to establish the management controls necessary for the proper handling of multi-billion dollar spare parts inventories held by DOD activities. The detection of over-pricing incidents became the lead stories of the morning and evening news programs as well as taking a prominent place with other major newspaper headlines.

As highlighted by Brooks P. Merritt in his masters degree thesis [Ref. 1:p. 9], "the genesis of recent procurement reform was the publication of the Carlucci Initiatives during the spring of 1981". The Carlucci Initiatives were the first major policy thrust of newly appointed Deputy Secretary of Defense, Frank Carlucci, and were developed to improve overall DOD management. Those initiatives subsequently provided the impetus for various actions from the Congress and DOD. Numerous policy directives were promulgated and Congress launched intensive pursuits to create competition between

suppliers and to place more stringent restrictions on the awarding of non-competitive contracts.

Congress' intense interest in solving the over-pricing problem and its concern about the decline in the public's trust in the defense procurement system as a whole led to the passage of three major laws in 1984:

- The Competition in Contracting Act (CICA)
- The Defense Procurement Reform Act (P.L. 98-525)
- The Small Business and Federal Procurement Competition Enhancement Act (P.L. 98-577).

While these laws have been highly effective in reducing spare parts prices and reforming the federal procurement system in general, the actions required to comply with them have had significant undesirable side effects. One of the major side effects is the problem of growing procurement lead times [Ref. 1:p. 8].

A thorough study of the causes and impacts of growing procurement lead times in DOD contracting was performed in 1986 by the Logistics Management Institute (LMI), a private non-profit research firm, under a Department of Defense contract. LMI issued its report in September 1986 entitled "Procurement Leadtime: The Forgotten Factor" [Ref. 2].

One of the major findings of the study was that Procurement Lead Time (PLT) for spare parts purchases had increased approximately sixty percent at some DOD Inventory Control Points (ICPs) to the extent that it routinely took

approximately nine months to award a contract to procure spare parts for wholesale stock [Ref. 2:p. 1-3]. The largest contributor to this rapid growth in PLT was determined to be Procurement Administrative Lead Time (PALT).

PALT is defined as the period of time in days between the initial identification of the need for a spare parts buy and the actual award of a contract.

To better grasp the impact of lengthening procurement lead time (PLT), a basic understanding of the components which make up PLT is essential. PLT is comprised of four cycles and eight segments as provided in Table I below.

TABLE I

COMPONENTS OF PROCUREMENT LEAD TIME

Cycles	Segments	
Requirement	1	Requirement Identification/Data Processing
	2	Inventory Management Review
	3	Technical Review
Procurement	4	Solicitation/Proposal Analysis
	5	Source Selection/Contract Award
Production	6	Manufacturing Process
Delivery	7	Shipping/Delivery
	8	Inspection/Acceptance

Source: Developed by Author

The requirement cycle at an ICP begins with the identification of a need to replenish stock or to buy a particular item and concludes when a "buy package" generated by an item manager has been screened by inventory, technical, and purchasing personnel and verified to have all of the pertinent information to commence procurement.

The buy package is then assigned to a buyer and the preaward procurement cycle commences. This cycle ends with the actual award of the contract.

The production and delivery cycles are post award activities and are comprised of the period of time required for the manufacturer or vendor to produce and deliver the item. This period is also known as Procurement Production Lead Time (PPLT). Once the item has been inspected and accepted, attesting to the fact that it meets the terms and conditions of the contract, the total procurement is completed.

Figure 1 provides an additional breakdown of procurement lead time and relates each cycle to procurement administrative lead time (PALT) and procurement production lead time (PPLT). Procurement lead time (PLT) is the combination of both PALT and PPLT.

Extended procurement administrative lead time periods have pronounced impacts on the procurement process and ultimately on the readiness of the fleet. More specifically, the LMI report identified the following major impacts [Ref. 2:p. ii]:

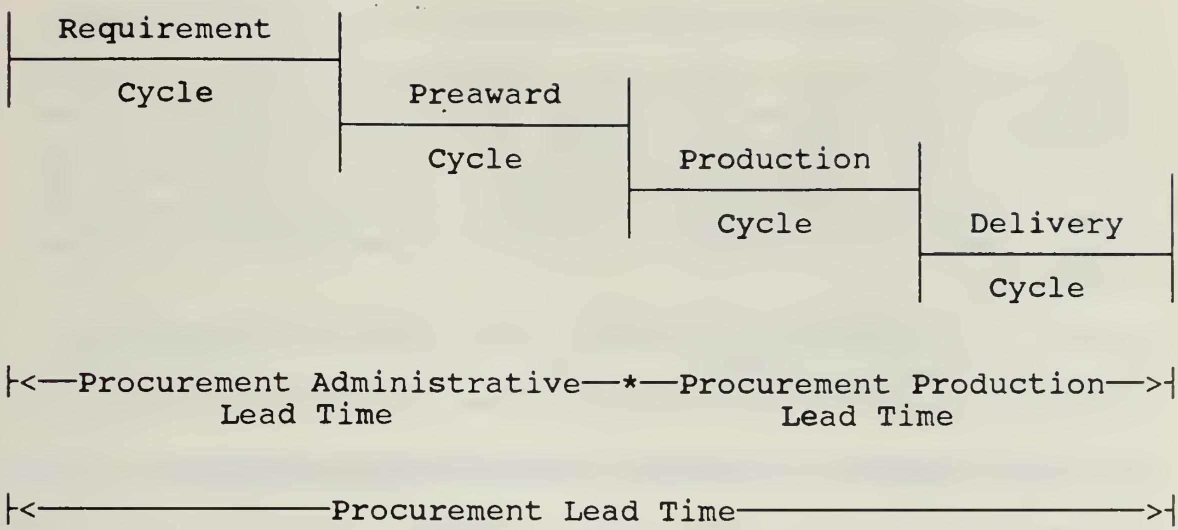

Figure 1. Breakdown of Procurement Lead Time
Source: Developed by Author

- increased forecasting errors as a result of attempting to forecast over a multi-year horizon
- reduced ability of the supply system to react to changes in demand, technology and operations
- reduced fleet readiness created by shortages of critical repair parts
- misallocated fiscal, personnel and warehousing resources resulting from excessive inventory levels and high safety levels to compensate for the PALT period.

Figure 2 shows a basic Economic Order Quantity (EOQ) model which is the heart of DOD inventory management procedures. The model implies that there is an optimum quantity (Q*) that should be ordered at an appropriate reorder point (ROP) to minimize the costs associated with procuring and warehousing an inventory item. As PALT increases three adjustments must be made to the model if there are to be no shortages, which is a primary goal of an ICP. These are:

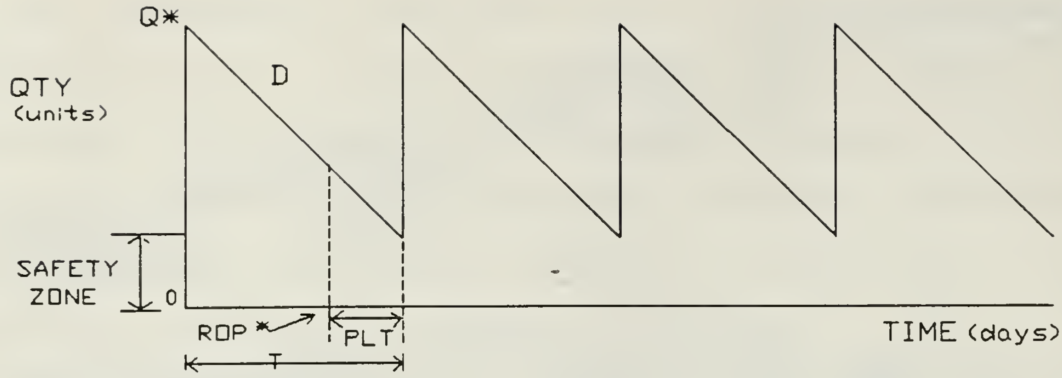

Figure 2. Economic Order Quantity Model

- safety levels of stock have to be reestablished
- the reorder point (ROP) must occur sooner
- the demand rate (D) has to be inflated to compensate for the inability to accurately forecast.

Each of the above adjustments, both singularly and collectively, cause a less efficient use of constrained resources. During fiscal year (FY) 1986, material requirements to support growing procurement lead times reached approximately $20 billion [Ref. 2:p. ii]. Since procurement lead times have continued to grow at most DOD activities, the funding required for safety stock has certainly risen. However, the Department of Defense's highly successful "competition" and "breakout" programs should have had positive counter-balancing effects on the funds required for safety stock.

LMI offered a number of recommendations to DOD to cope with the growing lead time problem [Ref. 2:p. 2-4 - 2-7].

Specifically, the following recommendation was made:

> Launch a pilot program to expand the use of indefinite delivery-type contracts at one or two selected ICPs. This pilot program should be designed to test the general applicability of the concept, estimate the value of sharing requirements and asset data with vendors, and determine the potential impact on ALT and PLT. [Ref. 2:p. 2-6]

Indefinite delivery type contracts (IDTCs) are a family of contracts which the government developed for use when the precise quantity requirement of an item or the delivery schedule cannot be accurately predicted. There are three sub-types of IDTCs:

- Definite Quantity
- Indefinite Quantity
- Requirements.

Both the Definite Quantity and the Indefinite Quantity contract obligate the Government respectively for either the full quantity or a minimum quantity (usually 10% of the contract price). The Requirement contract however is distinct in that the Government is not obligated to purchase anything unless an actual need develops [Ref. 3:p. 1].

B. FOCUS OF RESEARCH

This research effort focuses on the Navy Aviation Supply Office (ASO) Philadelphia's inventory to determine the applicability of requirements contracts to reduce the PALT at ASO.

Although all three types of IDTCs have the same effect on PALT, the study is confined to requirements contracts to limit the scope, and because the requirements contract is the most difficult of the three IDTCs to get a contractor to accept. Because ASO manages in excess of 200,000 line items for various aviation weapons systems, a review of all line items in the inventory is beyond the scope of this study. Thus the study included as its base approximately 13,000 line items in Federal Supply classes 16XX (the entire series), 5310, 5330, and 2840. These classes are mainly jet engine spare parts and accessories and were selected for the following reasons:

- the 1986 LMI study also focused on procurement lead time for jet engine spare parts

- these groups are made up of highly critical, highly expensive, and long lead time items

- a high level of competition exists with the commercial aerospace industry for the same or similar items

- ASO has already conducted limited experiments with expanding the use of requirements contracts for items in these classes.

To perform the necessary analysis the study included the inventory and contracting data compiled on each of the items during fiscal years 1987 and 1988, and the first quarter of fiscal year 1989.

The study focuses first on determining the essential conditions which must exist for an item to be a candidate for a requirements contract; secondly, in developing an Automated Decision Support System which would be capable of selecting

candidates based on given criteria; and thirdly, on measuring the PALT reductions from the use of requirements contracts.

In addition, the study includes surveys of other DOD activities to ascertain the results of their efforts (if any) in expanding the use of requirements contracts and of major defense manufacturers/vendors to obtain an assessment of the defense industry's willingness to accept requirements contracts.

C. RESEARCH QUESTIONS

The study sets out to answer the following primary question:

To what extent can Procurement Administrative Lead Time (PALT) for inventory items managed by the Navy Aviation Supply Office (ASO) be reduced by an expanded use of IDTC/requirements contracts?

In support of the primary research question, the following subsidiary questions are addressed:

- What are the conditions necessary for a requirements contract to be successfully used?
- What are the essential elements of a model which could be used to identify those ASO managed items which are good candidates for requirements contracts?
- What is the feasibility of developing an Automated Decision Support System (DSS) for identifying candidates for requirements contracts?

D. RESEARCH METHODOLOGY

The research for this study included inquiries of the databases at the Defense Logistics Studies Information Exchange (DLSIE), the Defense Technical Information Center (DTIC), and the Naval Postgraduate School for background information and the results of related studies. These inquiries yielded numerous studies on PALT but a limited number of studies on requirements contracts. There were only three studies in the databases specifically dealing with the procurement process at ASO.

Research data were primarily obtained via a trip by the author to the Navy Aviation Supply Office during which interviews of inventory management, procurement, comptroller, competition advocate and procurement policy personnel were conducted. Ideas were generated during these interviews as to how the research should be structured. Additionally, pertinent ASO documents, correspondence, databases and key personnel were identified and made available to the researcher. All the ASO personnel that were interviewed were extremely helpful and were a strong source of encouragement for the successful completion of this project.

In addition to personal interviews of ASO personnel, telephonic interviews were conducted with key inventory management/procurement personnel at the Army Aviation Systems Command, San Antonio Air Logistics Center, and various Defense Logistics Agency (DLA) ICPs (Defense Construction Supply

Center, Defense Industrial Supply Center, and Defense General Supply Center). As with the interviews at ASO, the personnel at each of these activities were very receptive and supportive of this effort.

To obtain specific data for the development of a DSS and to assess the defense industry's willingness to accept requirements contracts, surveys were sent to each of the DLA, Air Force and Army activities mentioned above. Surveys were also sent to ten major defense contractors/vendors who had previously received ASO spare parts contracts.

E. SCOPE OF THE STUDY

This study is limited to repair parts in federal supply classes 16XX (series), 5310, 5330, and 2840 managed by the Navy Aviation Supply Office. The study included quarterly inventory data for the above classes during the period of 1 October 1986 - 31 December 1988 (FY 87, FY 88, and first quarter FY 89). Likewise, contracts history data were limited to the same period and included all contracts both competitive and non-competitive with a dollar value of each contract being greater than or equal to $25,000.

F. ASSUMPTIONS

The only assumption included in this study was that the author assumed that the data resident in the various ASO databases were accurate, current, and complete as of the date of extraction.

G. ORGANIZATION OF THE STUDY

This thesis begins with an overview of PALT as a procurement issue and links this study as a follow-on to various studies over the past few years. Chapter II discusses the ASO procurement process including innovative actions taken by ASO to reduce its PALT and the results of those actions over the previous two fiscal years (FY 87 and FY 88).

Chapter III provides comprehensive explanations of the characteristics of requirements contracts and the mechanics of using them, including resource tradeoffs. It also explains the extent requirements contracts are currently used by ASO and other DOD contracting activities.

Chapter IV presents the results of the personal/telephonic interviews as well as an analysis of data obtained with the surveys. This presentation is followed by Chapter V which describes in detail the development, use and assessment of a Decision Support System. Chapter VI concludes the thesis by delineating the author's conclusions, recommendations and answers to the research questions.

II. ASO PROCUREMENT PROCESS

A. INTRODUCTION

It is difficult to argue with the statement that ASO is "big business." Table II shows ASO's business statistics which rank ASO with many of the largest private corporations.

TABLE II

ASO BUSINESS STATISTICS

Items Centrally Managed 252,257	Items Program Support Interest 635,207	Supply Systems Asset $16.71 Billion
FY 89 Acquisition Target $1.8 Billion	Contract Actions 37,000	Annual Requisitions 1.61 Million
FY 89 Component Research Budget $901 Million	Repair Action I Level 1,409,000	Repair Action D Level 286,000
FY 89 Operations Budget $92.3 Million	Military Personnel 88	Civilian Personnel 2410

Source: ASO Planning and Data Systems Directorate

With regards to procurement, ASO will engage in nearly 37,000 contracting actions during FY 89 with a dollar value of approximately 1.8 billion dollars to support 1.61 million requisitions from end users. During the two previous fiscal

years the work loads were very similar: 36,400 contracting actions during FY 87 valued at 1.7 billion dollars and 32,800 contracting actions during FY 88 worth 1.88 billion dollars. To carry out such a tasking ASO has a Purchase Directorate organized into purchase divisions and branches with various weapons systems assigned to each branch. The Purchase Directorate has an FY 89 authorized staffing of 172 contracting personnel and 102 support personnel. At the end of the first quarter there were 168 contracting personnel and 89 support personnel on board. Figure 3 is an organizational diagram of the Purchase Directorate.

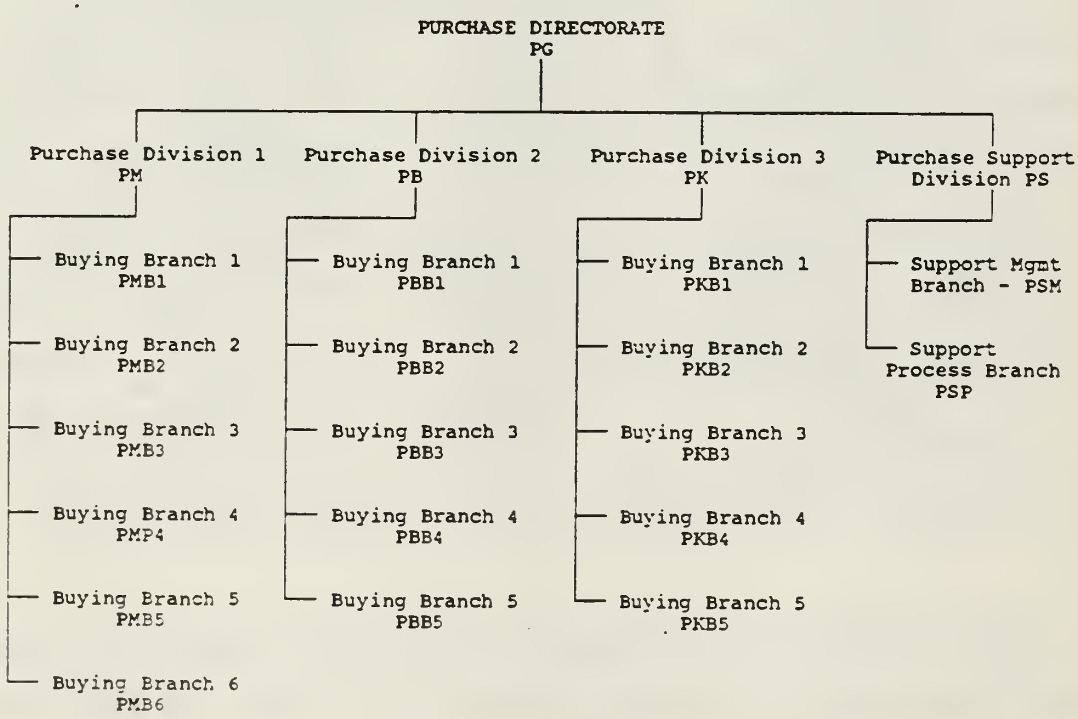

Figure 3. ASO Purchase Directorate
Source: ASO Planning and Data Systems Directorate

Prior to the Purchase Directorate commencing contracting for a stock replenishment item, several significant steps in the inventory control process would have been accomplished. The following section provides an overview of the entire replenishment process through contract award.

B. OVERVIEW OF ASO STOCK REPLENISHMENT PROCESS

ASO utilizes the Uniform Inventory Control Point (UICP) replenishment model to trigger the start of the replenishment process. After the process has begun several ASO directorates and branches accomplish specific actions prior to the beginning of actual procurement. Figure 4 presents a flow diagram of the replenishment process along with the ranges of times it has historically taken to accomplish the indicated activities.

There are two major programs in the UICP model. One is the Cyclic Levels and Forecasting (CLF) program and the other is the supply Demand Review (SDR). The CLF program is run quarterly and computes gross wholesale requirements for all ASO managed items based on demand from ASO customers. The CLF develops stock levels to:

- ensure stock availability to meet anticipated needs
- keep inventory levels within budget limits
- achieve effectiveness goals set by higher authority
- utilize available storage space efficiently.

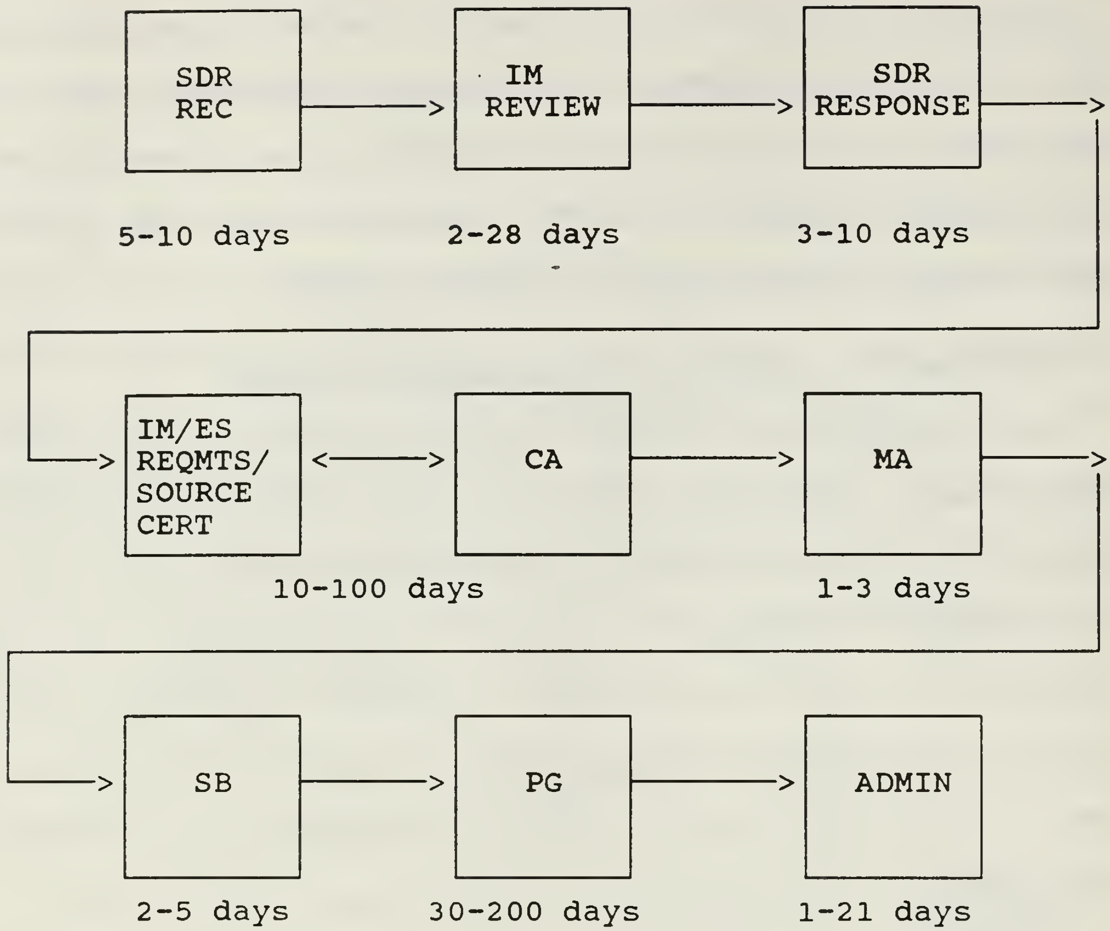

Figure 4. The ASO Replenishment Process
Source: ASO Systems Development Branch

The SDR program is also run quarterly and is designed to develop a "net asset position" by determining the number of ready for issue items (RFI) on hand and comparing it to the gross wholesale levels requirements generated by the CLF program. When net RFI assets are determined to be deficient, the SDR program, as applicable, will either initiate an automated procurement; generate a disposal recall recommendation: or provide a procurement recommendation to

an item manager (IM). The program will also generate a termination recommendation to an item manager for items on order in excess of requirements.

After receiving the recommendation from the SDR program, an item manager's role in the procurement process is as follows:

- to validate the requirement by conducting a demand and failure analysis of the item
- to justify the requirement to the Procurement Review Board
- to forward competition and sole source justification forms to the weapons management equipment specialists for technical screening
- to respond to the SDR recommendation.

When the buy package is forwarded to an equipment specialist, basically one of two types of technical screening takes place. For the less complex items a limited screen is performed. However for the more complex items, such as circuit board assemblies, a thorough and more complete technical review is performed along with a full breakout screen by the Competition Advocate (CA) division. [Ref. 1:p. 38]

Once the package has been completely screened and potential suppliers identified, it is then forwarded to the Material Accounting (MA) division for certification of funding. Additionally, to enhance the participation of small businesses, the package is routed via the Small and

Disadvantaged Business Utilization (SADBU) specialist prior to it reaching the purchase directorate for procurement.

As can be deduced by analyzing Figure 4, as many as 152 days have historically been expended on "pre-procurement" administrative actions and up to 373 days could be expended prior to a contractor receiving an award document. The procurement cycle has been largely responsible for the extended lead time period, taking as many as 200 days to solicit, negotiate, and award a definitively priced contract.

C. PALT STATISTICS

Procurement administrative lead time at ASO has become an ever increasing problem as it continues to grow. During FY 87, PALT averaged 310 days. In FY 88, PALT took a "prompt jump" to an average of 386 days [Ref. 4]. The primary cause for the continuing rapid rise in PALT at ASO has been attributed mainly to a reduction in the issuance of unpriced (or undefinitized) purchase orders as mandated by the Assistant Secretary of the Navy (Shipbuilding and Logistics) in a 1985 policy letter.

The effects on the ASO procurement process by the ASN (S&L) mandate is highlighted in an 1987 report by the ASO Director of Internal Review [Ref. 5]. The following excerpt from the director's report amply describes the dilemma which ASO faces:

Prior to fiscal year 1986, approximately 73% of all ASO procurement dollars were obligated using unpriced basic ordering agreements. Presently, ASO's goal is to reduce unpriced orders to only 40% of FY 87 obligations.

An unpriced order enables ASO to place an order with a vendor prior to the establishment of a firm fixed contract price. In the past, ASO's heavy use of unpriced orders has aided in keeping procurement administrative lead time (PALT) relatively low (97.69 days in FY 85). Fiscal year 86 restrictions on the use of unpriced orders have caused PALT increases, future increases are expected. By issuing an unpriced order, a contracting facility can commence production; subsequently, reducing the other lengthy administrative lead time that accompanies priced orders. In addition to a 52 day synopsis period required for all sole source procurements (priced/unpriced) over $10,000, and all competitive procurements over $25,000, priced orders are impacted by other administrative time constraints. Submission and receipt of a Request for Proposal (RFP)/Request for Quotation (RFQ) can require up to 60 days. Also, priced orders over $100,000 must ordinarily be submitted for review by DCAA/DCAS agencies. The time frame for this review is 45-60 days.

In conclusion, ASO cannot negotiate a priced order until the minimum administrative lead time mentioned above is exhausted; whereas, an unpriced order enables a contractor to begin manufacture while a firm - fixed price is being negotiated.

ASO has been highly aggressive in exploring innovative ways to reduce PALT while simultaneously striving to lower the use of unpriced purchase orders. As an initial action to tackle the program as a command issue vice a procurement issue, the Commanding Officer promulgated a policy memorandum in December 1987 establishing a formal ASO Acquisition Improvement Program [Ref. 6]. The program was designed to operate through an ad hoc committee composed of a principal representative from each ASO directorate as well as the Office of Counsel. The primary duty of the committee was to conduct

a complete in-depth review of ASO's acquisition process, and to develop and implement improvements to make it more efficient [Ref. 6:p. 1]. Table III provides several of the major recommendations of the committee [Ref. 7].

TABLE III

RECOMMENDATIONS OF ACQUISITION IMPROVEMENT COMMITTEE

Internal Streamlining
- Automated Synopsis
- Deletion of general industry specification from bid packages
- Reduce purchase request returns from the procurement directorate to weapons managers
- Faster response to contractor questions
- Use of automated data bases
- Establishment of on-line "standing contractor proposals"
Contracting Changes
- Negotiation of tailored firm fixed price catalogues for mature aircraft engine parts
- Expanded use of Requirements Contracts

This research project is an adjunct effort to the other efforts being carried out by ASO and focuses on the last recommendation listed in Table III, i.e., expanding the use of requirements contracts.

III. REQUIREMENTS CONTRACTS

A. DESCRIPTION

As previously discussed, requirements contracts are one of three subtypes of indefinite delivery type contracts. The requirements contract provides that all purchase requirements for a particular item or service (during a specified contract period) be procured exclusively from one contractor. At the time of contract award, neither the actual quantity required nor the delivery schedule is always known.

The contract quantity is arrived at by analyzing past requirements and forecasting future needs. From this analysis the Government develops what is called a best estimated quantity (BEQ). Along with the BEQ the contract will contain the agreed upon unit prices, delivery schedules and pertinent contract clauses. Unlike other contracts, a requirements contracts will also designate the officer(s) authorized to place delivery orders against the contract and a quantity limitation beyond which the contractor is not unilaterally obligated to provide. If deemed necessary, a minimum guaranteed quantity may be specified to reduce contractor risk [Ref. 8:p. 6].

Solicitation, negotiation and award of a requirements contract is no different than any other type of contracting action as far as procurement laws and regulations are

concerned. The Competition in Contracting Act (CICA), the Truth in Negotiations Act (TINA), etc. still apply with equal force. Although a sole source relationship with an exclusive contractor is established by a requirements contract, it is generally established through full and open competition. However, requirements contracts are commonly awarded under non-competitive conditions.

Requirements contracts may include any pricing mechanism permitted by regulations. They may be Firm-Fixed Frice (FFP), Fixed Price Incentive (FPI), Fixed Price with Economic Price Adjustment (FP w/EPA), Cost Reimbursement contracts, or Time and Material (T & M) contracts. The decision is made using the same criteria as any other contract, i.e., it normally depends upon the degree of certainty/risk in performing the effort [Ref. 8:p. 5].

Requirements contracts may be written for up to a four year period after the base year (i.e., 5 years total). Options may also be incorporated into the basic contract for additional quantities or periods. If included, options must be exercised at the specified point stipulated in the terms of the contract [Ref. 9:p. 16.503].

There are distinct advantages and disadvantages to using requirements contracts. In his paper [Ref. 10], James P. Carson noted the below listed advantages from the Government's perspective:

- increased flexibility with respect to both quantities ordered and delivery scheduling

- better use of funds since supplies or services are ordered only after an actual need has materialized

- more expedient delivery from the contractor since the contractor is usually willing to maintain limited stocks in view of the Government's commitment

- lower cost may be realized through combining several anticipated requirements into one quantity procurement

- lower warehousing costs because requirements contracts permit stocks to be maintained at minimum levels and allow direct shipment to the user.

From the Government's point of view there are also disadvantages. Among them are [Ref. 7:p. 7]:

- requirements contracts require close monitoring and maintenance of a separate ledger of contract obligations

- because of the dangers involved in the commitment to have an exclusive arrangement with one contractor, the statement of work (SOW) has to be more defined than the other types of IDTCs in order to preclude a breach of contract

- since the contract is established exclusively with one source, problems could arise if performance is not satisfactory and the time to remedy the situation is extensive

- considerable effort is required to develop good faith estimates of the quantity required and the delivery schedule.

The major advantage from a contractor's perspective is that if the need does occur, the contractor will receive orders for all of an activity's requirements for a particular item or service during the contract period. The contractor should also be able to enjoy savings from quantity discounts with suppliers and perhaps a more efficient scheduling of production activities.

The obvious disadvantage to the contractor is that he may invest resources and never receive an order(s) in an amount sufficient to recover fixed costs. Including a guaranteed minimum quantity in the contract could partially or completely offset this disadvantage.

B. MECHANICS OF USING REQUIREMENTS CONTRACT

Historically, IDTCs have been used to procure large quantities of common and repetitive commercial items. However, in response to changing needs, innovative use of this contract type for a variety of other purposes has become common [Ref. 8:p. 1].

The key to using IDTCs, and requirements contracts in particular at an ICP, is the process used to identify which inventory items best lend themselves to this contracting method. To determine the applicability of a requirements contract, as a minimum the following actions must be accomplished:

- a demand analysis of both previous and anticipated demand must be performed to determine the demand profile expected during the contract period

- a technical analysis must be completed to determine whether or not the design of the item is mature or at least relatively stable

- an industry survey must be conducted to assess the willingness of the industry to accept requirements contracts.

Once a requirements contract is awarded it will require close monitoring to insure that funds obligated, labor hours

expended, costs incurred, etc. are carefully tracked for each contract year/period of performance [Ref. 8:p. 10]. If ordering officers outside of the ICP purchasing directorate are designated, additional oversight is required.

The greatest potential reductions in PALT from using requirements contracts are realized under multiple year contracting and the use of options. PALT for a requirements contract under worst case conditions should be no longer than the currently experienced PALTs. However, for the "outyears" or "option years" on multiple year and options contracts respectively, PALT is equal only to the average time it takes to place delivery orders against the contract. That time currently ranges at most DOD ICPs from 10 to 60 days depending on the degree of automation. Even if a requirements contract is awarded on a annual basis, there are still considerable potential PALT savings. These savings are realized when the reprocurement process is started early enough to allow the follow-on contract to commence upon completion of the contract in place. The starting date in the reprocurement process is analogous to the Reorder Point in Figure 2. The longer the PALT the earlier the start date.

C. RESOURCE REQUIREMENTS/TRADEOFFS

To effectively use requirements contracts the identification of candidates from the inventory is critical.

This identification process is resource intensive in terms of both personnel and equipment.

The identification process involves not only purchasing personnel, but also other individuals across various organizational boundaries. The Weapons Managers must provide the analysis of technical and demand history data; Financial Managers must provide funding guidance; Competition Advocate and Procurement Policy personnel must assess compliance with regulations as well as the impact on the defense industrial base; and Purchasing Managers must develop an appropriate acquisition strategy.

The above mentioned managers are involved in varying degrees on every stock replenishment. However, more detailed involvement is required from each of them to select only those items which meets the criteria of a requirements contract.

If the candidate determination process is automated, expertise with the various ICP databases and a familiarization with mainframe/microcomputers are also necessary. Fortunately, at each ICP this knowledge and expertise already exists in the macro sense. However, the synthesizing of these talents, for the purpose of identifying requirements contracts candidates, still requires additional guidance and coordination. In Chapter V of this thesis, a description of the databases and a type of software program which could automate the process will be presented.

Although considerable upfront efforts are required to successfully use requirements contracts, the potential savings from the reductions in PALT which results from their use far exceed the resources required. The reductions in safety stock alone should be sufficient enough to offset the resource requirements.

D. CURRENT USE OF IDTCs/REQUIREMENTS CONTRACTS AT ASO

Although strong command emphasis has been placed on expanding the use of requirements contracts, ASO has experienced difficulty in executing the concept. In early 1988, a draft Plan of Action and Milestones (POA&M) was promulgated by the ASO Acquisition Improvement Committee which outlined the actions required of the ASO directorates to execute the expansion [Ref. 11]. The POA&M targeted 1 February 1988 as an implementation date.

To date the plan has not been fully implemented as a result of the committee's failure to address specific concerns among the directorates. An 11 May 1988 memorandum from the Weapons Management Policy Branch to the committee clearly expresses these concerns. The memo contained the following general comment [Ref. 12]:

> Requirements contracts appear to be a valid type of contractual agreement to pursue. The reduction in lead time and flexibility of order quantities are improvements over the current vehicles available. However, the question of measuring PALT remains to be solved. The initial PALT on the item will be representative of current competitive PALTs but the PALT on orders placed after award will be approximately 45 days. Once the contract is complete the PALT will revert back to the normal

competitive PALT. This creates a files maintenance problem and confusion in calculating the valid lead time requirement.

Perhaps another reason for ASO's difficulty in implementing the plan has been the candidate determination process. The Weapons Management Directorate is assigned responsibility, by the draft plan, of identifying items for requirements contracts. The directorate proposed that a fixed universe, specifically, competitive high demand items with a contract value of $25,000 or more be considered as candidates. The universe of these items was determined to be approximately 500 [Ref. 12]. From this universe ASO has awarded only 11 IDTCs during FY89. Likewise, only 12 IDTCs were awarded during FY 88 [Ref. 13].

In view of ASO's current low use of IDTCs the author feels that ASO has only "scratched the surface" of opportunity for using this type of contracting method for replenishing its inventory. However, to effectively increase the usage, a credible method of determining candidates and a <u>total team effort</u> are required.

E. USE OF IDTCs/REQUIREMENTS CONTRACTS AT OTHER DOD ACTIVITIES

1. Defense Logistics Agency (DLA)

Mainly as a result of the nature of the items that DLA activities manage (commercially available, high volume, low dollar value, etc.), DLA has taken the lead in expanding the use of IDTCs in general and requirements contracts in

particular. During August 1986, DLA Headquarters issued policy guidance on increasing the use of IDTCs [Ref. 14]. The policy delineated the criteria for selecting candidates and established a goal of awarding 15 percent of the FY 87 obligations as IDTCs. To meet this goal, DLA implemented several innovative initiatives at various DLA ICPs. At the Defense Industrial Supply Center (DISC) and the Defense Construction Supply Center (DCSC), the concept of "family grouping" was implemented. With this concept, all items that meet the selection criteria, with the exception of minimum contract dollar value ($100,000), are grouped together and ordered on the same contract. Not only does family grouping increase the number of items awarded on an IDTC contract and enhance a reduction in PALT, but it also increases unit price savings resulting from:

- lower fixed costs created by eliminating redundant set up costs for related items manufactured on the same production equipment

- quantity discounts.

At the Defense General Supply Center (DGSC) primarily, emphasis has been placed on paperless orders. With DGSC's Paperless Order Placement System (POPS), delivery orders are issued electronically against established requirements contracts. The program provides for the capability to place orders directly with contractors via electronic means. By using computer-to-computer interfacing to place orders, hardcopy delivery orders are eliminated. [Ref. 15]

DGSC currently has 36 POPS requirements contracts with 22 contractors. There are 1,816 inventory items on contracts with 2,187 additional items in various acquisition stages [Ref. 15].

The majority of the IDTCs/requirements contracts at DISC are in the following federal supply classes [Ref. 16]:

- 3110: Bearings
- 4010: Pipes
- 5310: Miscellaneous Hardware
- 6145: Wires and Cables
- 9515, 9520, 9535: Steel.

Under the family grouping initiative, DISC is in the process of grouping 1,636 inventory items on 25 IDTC/requirements contracts with an estimated value of $33.1 million.

As of February 1989, DCSC had 190 requirements contracts in existence that covered 260 inventory items. During calendar year 1988, requirements contracts accounted for over $50 million of the total obligations. [Ref. 17]

2. <u>Army Aviation Systems Command (AVSCOM)</u>

Requirements contracts at AVSCOM have been extensively used for maintenance and overhaul actions and for engineering services. During fiscal years 1987 and 1988, AVSCOM awarded 122 requirements contracts for $108.6 million and 151 requirements contracts for $112 million respectively. These

contracts were awarded to 47 different aerospace industry contractors [Ref. 18].

During fiscal year 1987 AVSCOM attempted to further expand the use of IDTCs/requirements contracts. AVSCOM's Directorate of Material Management identified items which were felt to be good candidates, however, no new requirements contracts were generated. The reasons behind this failed attempt were:

- lack of faith in the requirements generation process
- overburdened buyers' inability to find the time to learn/develop new procedures
- lack of management emphasis. [Ref. 18]

The results of this attempt points again to the importance of the candidate identification process. To be successful, a well developed strategy must be in place.

3. <u>San Antonio Air Logistics Center (SA/ALC)</u>

SA/ALC emphasis has not only been in the area of expanding the use of IDTCs/requirements contracts but also on the concept of multiple year contracting (MYC). A policy letter from the Director, Contracting and Manufacturing captures SA/ALC's emphasis on expanding the use of IDTCs [Ref. 19]:

> There is one critical area which is keeping this directorate from being completely successful in its mission support responsibilities. That area is administrative lead time. It simply takes too long to turn PRs into contracts. We must take aggressive <u>positive</u> action to reduce our lead time through more innovative application of the contracting tools available to us. Buyers and contracting officers must join their supervisors and assume the initiative to make lead time

reductions a fact. When history shows a repetitive buy of a particular item over several years, we must take initiative to issue a requirements or indefinite quantity type contract.

Additionally, SA/ALC Instruction 0-87 integrated the use of IDTCs with multiple year contracting. Figures 5 and 6 depict SA/ALC's success in multiple year contracting and in expanding the use of IDTCs.

In Figure 5 the top line provides the number of MYC candidates that were identified during the period of November 1987 through March 1988. The bottom line indicates the number of MYCs that were actually awarded from these candidates.

Figure 6 gives a pictorial view of the types of MYC contracts that were used for the awards during that same period and their relative percentages. The majority of the MYC awards were under Quantity Discount Procedures which aims at cost reductions through volume purchases. Requirements contracts were the second most prevalent type of contract used.

SA/ALC's use of multiple year contracts has continued to grow. During January 1989, 1199 items were screened with 95 resulting in an MYC award. These awards included 15 IDTCs of which seven were requirements contracts.

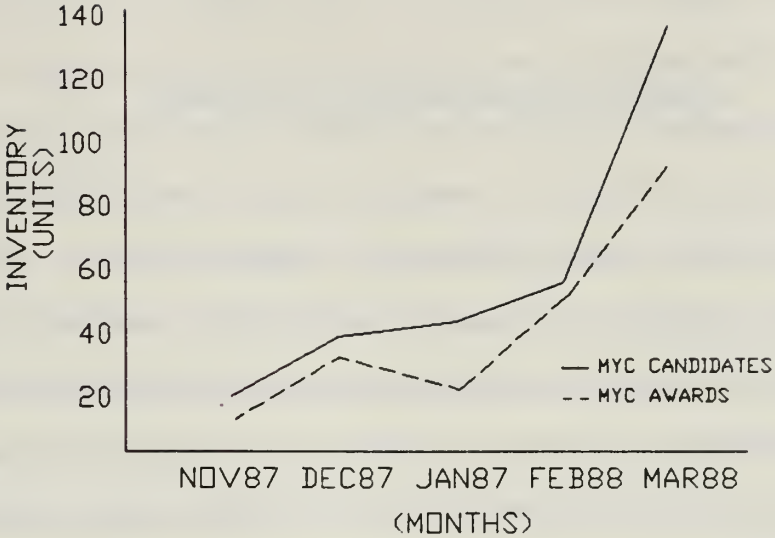

Figure 5. MYC Candidate Awards
Source: SA/ALC PMC

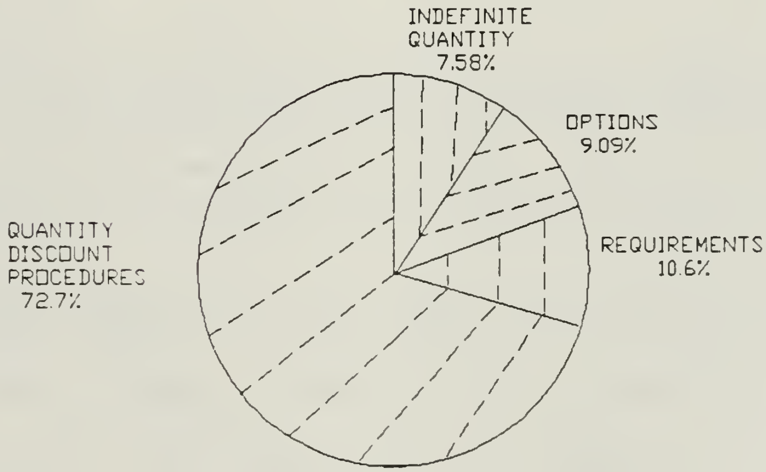

Figure 6. MYC Candidate Awards/Contracting Method
Source: SA/ALC DMC

The above statistics on the usage of IDTCs at other DOD ICPs substantiate the potential for expanding the use of IDTCs/requirements contracts at ASO. The <u>primary factor</u> with regards to the extent of usage at each activity included in this study was the technique employed for identifying candidates. Clearly as identified by the results at DGSC and SA/ALC, as the universe of items screened is increased, so are the identified candidates. In the next chapter (Chapter IV), the technique employed by DOD ICPs and the essential elements that should be included in a model for determining candidates are presented.

IV. CANDIDATE DETERMINATION METHODS

A. INTRODUCTION

For the overall PALT to be impacted by the use of IDTCs/requirements contracts at ASO, the number of IDTCs/requirements contracts awarded has to be significantly increased. Furthermore, for the number of IDTCs awarded to be increased, the number of candidates identified must also increase.

As an effort to develop a comprehensive method for determining IDTC/requirements contracts candidates at ASO, the survey form in Appendix A was sent to the DLA, Army, and Air Force ICPs included in this study. The objectives of the survey were to:

- determine the method(s) that each of them utilize for determining IDTC/requirements contracts candidates
- determine what essential elements should be included in a model for determining IDTC/requirements contracts candidates
- determine the extent which IDTC/requirements contracts are currently used.

The survey revealed that none of the ICPs had conducted recent studies which specifically focused on the use of IDTCs/requirements contracts. However, each activity indicated that greater emphasis is being placed on expanding the use of IDTCs and particularly, requirements contracts.

The survey also revealed that DOD ICPs use various methods for determining IDTC/requirements contracts candidates. These methods range from formal committees to less formal procedures whereby candidates are identified by screening individual purchase requests as they are generated.

1. Defense Logistics Agency (DLA)

At Defense Logistic Agency ICPs the formal committee approach is primarily used. In Section V of DLA's Long Term Contracting Guidebook [Ref. 20], the use of interdirectorate groups to identify long term contracting candidates is emphasized. IDTC/requirements contracts are considered as a long term contracting method. The Guidebook stipulates that:

> Participation in the group meetings should come from each of the functional offices involved with the acquisition. Each specialist is responsible for bringing the appropriate background information to the group. Specifically the Item Manager identifies past requirements and demand data, and future estimated requirements; the QAR (Quality Assurance Representative) identifies past quality problems, issues, and testing requirements; the Technician identifies the stability of the item design, commerciality, the impact of alternate offers, and potential family grouping of items; the Contracting Officer identifies past buying practices and problems, competition requirements, pricing issues, and industry responsiveness to alternate contracting approaches; and the Financial Expert identifies funding issues and problems that may impact contract type. Effective exchange of information will allow the participants the opportunity to expand and to understand and identify blocks in the overall acquisition process.

The Guidebook also provides a "decision matrix" for choosing the optimum contracting approach. A copy of the matrix is included as Appendix B. From a large purchasing (>$25,000) perspective which is the focus of this study, Table

VI in Appendix B provides the essential criteria that are to be used by DLA ICPs for determining when each long term contracting method is appropriate. Of particular interest is the selection criteria for choosing candidates for requirements contracts (RTC), multiple year requirements contracts (RTC-Multi Year) and indefinite quantity contracts. The table also identifies which of the DLA Automated Procurement Systems (Paperless Order Placement System (POPS), Contractor Operated Parts Depot (COPAD), and Automated Delivery Order Advance Agreement) would be appropriate for each long term contract type.

For an item to be a good candidate for a requirements contract, DLA requires the item to meet the following specific criteria [Ref. 20:p 7]:

- the industry must be responsive to this type of contracting method

- recurring requirements must exist but precise quantities cannot be pre-determined

- the item should have a stable design, but need not be exclusively a commercial or modified commercial item

- the dollar value of the demands should be as follows:

  - a yearly demand of $100,000 for a single National Stock Number (NSN), when the contract covers only one NSN

  - a yearly demand of $25,000 for a single NSN in a group of homogenous NSNs, with a yearly demand of $100,000 for the total group of NSNs, when the contract covers more than one NSN

- there should be multiple delivery orders anticipated to be issued against the contract during the contract period.

To further increase the number of long term contracts candidates, DLA has implemented a Procurement Group Coding (PGC) or Family Group Program which groups together items which have similar characteristics. Similar characteristics are defined as similar manufacturing processes, similar material composition, or similar end item application [Ref. 20:p. II-7].

Under PGC, one solicitation is issued for a group of items. The process of grouping similar items increases the dollar value of the solicitation, thereby potentially increasing industry interest in the acquisition [Ref. 20:p. II-7].

Table VII of Appendix B gives the offices within a DLA ICP which are responsible for initiating actions for procurement group coding of inventory items. Technical personnel have been given responsibility for identifying similar technical characteristics of items and acting as the primary initiator of procurement grouping. Item managers are considered to have the most important role in determining the success of procurement grouping, since they manage both the "recommended buy" studies and the requirements generation process. The Contracting Officer has been given responsibility for using the most efficient method of contracting to realize the benefits associated with procurement grouping. [Ref. 20:p. II-8]

2. Army Aviation systems Command

At the Army Aviation Systems Command, IDTC/requirements candidates are identified by the Directorate of Material Management based on stable demand and a minimum contract dollar value threshold. In general, all competitive Maintenance and Overhaul (M&O) items are placed on requirements contracts. Additionally, some sole source requirements are placed on requirements contracts if a competitive technical data package is not anticipated to be issued in the near future.

Appropriate candidates are considered to be those that are stable in demand and have a minimum annual contract dollar value of at least $100,000 [Ref. 18].

3. San Antonio Air Logistics Center

San Antonio Air Logistics Center uses a "requirements identified approach" for determining IDTC/requirements contracts candidates. Under this approach, every purchase request is required to have a Multiple Year Contracting (MYC) Decision and Information (D&I) Sheet attached. A copy of an MYC Decision and Information Sheet is included in Appendix C.

The MYC Decision and Information Sheet is used by the Directorate of Material Management to identify good MYC candidates. The sheet is prepared by the purchase request initiator for each applicable NSN on every purchase request. Part I of the sheet provides item identification information. Parts II and III represent the heart of the candidate

determination process. In these parts are contained the specific selection criteria.

Part II is designed to provide a quick decision as to whether the item should be further screened as a multiple year candidate. In this part are two basic screening criteria:

- Program Stability: A stable program indicates that the part, end item or system being supported is not being phased-out.

- Design Stability: A stable design indicates the part or end-item on a system being supported is not being modified. [Ref. 21:p. 10]

Demand and requirements patterns are considered in Part III. This section is designed for identification of current and out year requirements. The requirements included in this section are the Total Contract Maximum Quantity, the Maximum Ordering Quantity, and the Minimum Ordering Quantity. The Total Contract Maximum Quantity is the total quantity of units that can be ordered for the life of the contract and is normally 150% of the Best Estimated Quantity (BEQ). The Maximum Ordering Quantity is the largest single order that will be allowed to be placed against the contract and is normally 150% of the Best Estimated Average Order Quantity or the Initial Order Quantity; whichever is greater. The Minimum Ordering Quantity is the smallest single order quantity that will ever be placed against the contract and is normally 25% of the Best Estimated Average Order Quantity. [Ref. 21:p. 13]

4. Navy Aviation Supply Office (ASO)

As discussed in Chapter III, ASO has delegated the responsibility of identifying IDTC/requirements contracts candidates to the Weapons Management Directorate. Weapons managers identify and recommend requirements contracts candidates by completing and forwarding a Requirements Contract Candidate Worksheet to the purchasing directorate who reviews the worksheet and, if appropriate, proceed with the steps necessary to award a requirements contract. A sample Requirements Contract Candidate worksheet is contained in Appendix D. The specific criteria used by ASO to determine candidates are:

- recurring requirements are anticipated for the item during the period of the contract
- the item must have a stable demand pattern
- the design must be stable [Ref. 11].

B. IDTC/REQUIREMENTS CONTRACTS SELECTION CRITERIA

Although the methods used by each ICP differs, there are many common threads shared by each method with respect to what elements in the selection criteria are considered to be essential. From a comparison of the methods and phone/personal interviews of key purchasing, inventory management, technical and financial personnel, the following are the essential elements that should exist in a model for determining IDTC/requirements contracts candidates:

- recurring demand throughout the contract period

- stable demand pattern

- stable design

- stable program

- for single NSN contracts, a minimum total contract dollar value of $100,000

- for multiple NSN contracts, a yearly demand of at least $25,000 for a single NSN in a group, and a yearly demand of at least $100,000 for the total group

- industry acceptability of requirements contracts.

C. BASIS FOR THE ESSENTIAL ELEMENTS

1. Recurring Demand/Demand Pattern

The demand profile of an inventory item is the most essential element in the determination process. A non-recurring demand decreases a contractor's willingness to accept IDTCs since it increases the contractor's risk if production requirements cannot be reasonably estimated. To that end, an unstable demand could either over task a contractor's production facilities or possibly leave a contractor with idle facilities if the contractor did not have other work to make up for low demand periods.

Exactly how much demand variability a contractor would be willing to accept depends on many factors. Among them are:

- fixed set up costs

- nature of the items manufactured, e.g., advanced electronics components as compared to standard commercial stock items

- competitiveness of the business environment

- availability of raw materials
- degree of reliance on subcontractors
- faith in the government quantity estimates
- past experience, etc.

2. Design Stability

Design instability comes in many varieties. Minor changes to drawings and configurations that do not significantly alter the manufacturing process should be tolerable to the average contractor. However, even minor changes frequently create inefficiencies in the contractor's manufacturing process and impedes their ability to meet delivery schedules. Major changes may also necessitate capital investments which could lead to a contractor's inability to complete the contract. Changes of this magnitude could negatively effect both the contractor and the government since neither party may receive an adequate return on investment. A well defined requirement and a clear Statement Of Work are critical factors which minimize design changes.

3. Progam Stability

The major effect of program instability is on multiple year contracting. The greatest potential benefit in terms of procurement lead time reduction occurs during the "out years", whether multiple year or contracts with options. Programs that are being phased out negate these potential benefits. Also, for stable programs, contractors that know a contract will extend over a multiple year period are generally willing

to maintain a limited stock of raw materials. This generally results in lower prices and reduced production lead time.

4. Contract Dollar Value Thresholds

The $100,000 minimum contract dollar value element is based on the large purchase threshold of $25,000 or greater and four quarterly Supply Demand Review (SDR) generated stock buys. If a delivery order will result in a buy of less than $25,000, which would occur if the sum of the four quarterly buys totaled less than $100,000, the item could be more efficiently purchased using small purchasing procedures which has less administrative requirements and is generally automated. Similarly, if the annual contract dollar value of a single NSN will be less than $25,000, small purchasing procedures should be used.

5. Willingness of Industry

The most difficult of all the elements to assess is the willingness of the industry to accept requirements contracts. Because there are generally no guaranteed minimum purchase quantity with a requirements contract, many contractors are reluctant to accept this contract type.

The general environment that exists today in defense procurement is distrust on the part of both the government and industry. The President's Blue Ribbon Commission on Government Procurement (Packard Commission) highlighted this adversarial relationship [Ref. 22]. An Industry Advisory Committee comprised of senior defense industry executives

again addressed this problem in their initial report [Ref. 23]. The following is an excerpt from the report:

> The lack of trust in the defense acquisition process has diverted time and energy into unproductive activity, obscured lines of authority and fields of unexpertise, added significant costs to defense procurement, impeded technological advances and extended our schedules.
>
> Despite the unique relationships among Congress, DOD, and the defense industry, we dare not be adversaries. Yet, that is the relationship we are on the verge of institutionalizing. Congress, DOD, and the defense industry must work together to prevent a permanent polarization of the defense acquisition process and avoid the long-term adverse consequences....

To assess the willingness of DOD contractors to accept requirements contracts, a survey was sent to ten contractors who have received contracts from ASO for spare parts. The survey contained in Appendix E requested the contractor to:

- provide a list of the essential conditions that must exist for the contractor to accept a requirements contract

- to analyze four items which it manufactures and indicate whether or not a requirements contract would be acceptable to them (with or without option periods)

- to identify general categories of items which it felt would be good candidates for requirements contracts.

Only two of the ten contractors responded to the survey. A follow up with several of the contractors indicated that either the survey was misrouted within the company or several of their divisions had to be involved to provide an appropriate response. The author feels that the government procurement/industry environment was also a factor in the low response rate.

The results from the two surveys that were returned and from two phone interviews with Defense Contractors revealed the following:

- demand stability is a major factor in the decision to accept IDTCs/requirements contracts

- design stability is considered to only be a moderate factor

- an option period of one year is generally acceptable

- the following general categories of items are considered as good candidates for IDTCs/requirements contracts:

* wheels	* shafts
* brakes	* stators
* blades	* gears
* vanes	* gear boxes
* disks	* cases
* hubs	* ducts.

D. ASSESSMENT OF CURRENT CANDIDATE DETERMINATION APPROACHES

Although the essential elements that should be considered for IDTC/requirements contracts are generally addressed in the services' guidebooks and directives, the issue of the best method for using these elements to determine candidates from multi-thousand item ICP inventories is not sufficiently addressed. A committee approach is very thorough and comprehensive, yet it is slow and can only consider a small universe of items at a time. Having inventory managers alone identify candidates shifts a disproportionate amount of the responsibility on one directorate. Screening individual purchase requests insures each item is carefully considered, but this approach results in duplicated efforts that could be

saved if a large volume of items were being considered at the same time.

The author feels the most efficient and effective way of determining IDTC/requirements contracts candidates is to develop an Automated Decision Support System that is capable of screening and selecting only those items which exhibit the essential elements that were previously defined. Such a decision support system is the subject of Chapter V.

V. DECISION SUPPORT MODEL

A. INTRODUCTION

Decision support systems (DSS) are intended to aid managers who must make decisions when only some of the pertinent details of the situation are known, that is, under unstructured or partially structured conditions. The objectives of a DSS is accomplished through information retrieval, which in many instances already reside in the databases maintained by the organization, and through information generation. [Ref. 24:p. 539]

Although the organizations' databases may contain the information needed to address a management problem, generally there would have never been a prior need for the information in the unique manner which the current problem requires. Thus, no application programs would exist to provide for retrieval of data and preparation of reports. [Ref. 24:p. 539]

Conversely, when new or unexpected problems arise, the information that is needed by managers to address a particular problem may not exist. This will require information to be developed. Using the facts and data retrieved from the organizations' databases or provided by users, a DSS can interrelate the details in a model which could be used to provide a solution to the problem. [Ref. 24:p. 540]

A DSS consists of three components: an interface mechanism, a data subsystem, and a model subsystem. The interface mechanism provides a way for a user to interact with the system, typically through a computer keyboard. The data subsystem includes the means for retrieving and processing data from formal databases and the tools to manage the data. A DSS utilizes two types of databases: the organization database and a logically separate DSS database, usually a smaller unit which contains summary information (based on that included in the organization database). Special extraction software is used to summarize and store the data in the DSS database. The model subsystem manages the storage and retrieval of the DSS models. [Ref. 24:p. 540]

Using a Decision Support System involves an iterative process. Five steps can be visualized in using a DSS as depicted in Figure 7 [Ref. 24:p. 545].

In using a DSS, the problem is examined, and a formulation that permits study of the problem is developed. Next, pertinent parameters and variables are identified, to give the user an understanding of the situation. A model is then built by interrelating the parameters and variables in a manner prescribed by the user.

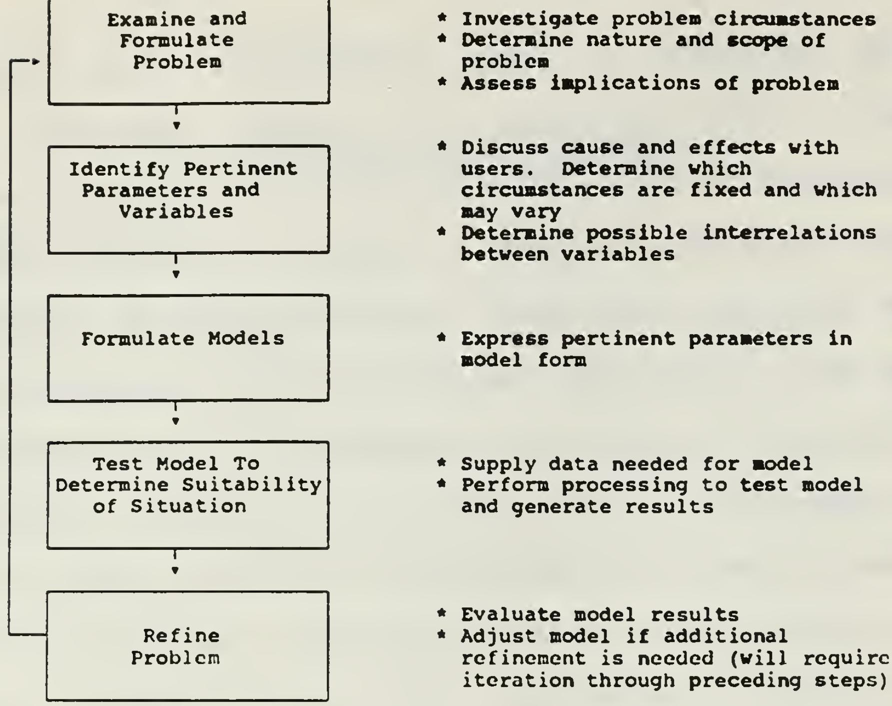

Figure 7. Steps in Using A DSS
Source: Financial Management Theory and Practice
(Eugene F. Brigham and Louis C. Gapenski)

Testing the model involves supplying data for the variables and carrying out the processing and recalculations to determine the results. Seldom is a model for an unstructured problem correct the first time; thus an important step in using a DSS is refinement of the problem. This may require the process to be repeated a number of times until the users feel that they understand the situation as well as possible. [Ref. 24:p. 546]

This process was carried out while developing a DSS to address the IDTC/requirements contracts candidate determination problem at ASO.

B. DEVELOPMENT OF AN IDTC/REQUIREMENTS CONTRACT DSS

Following the determination of the essential elements which should be considered in a model for selecting IDTC/requirements contracts candidates, the researcher identified those elements to the ASO Systems Development (SD) Branch to determine whether or not data resided in the various ASO databases which could be used by a computer to determine if the elements existed for an inventory item. Computer analysts and programmers studied the essential elements and developed a work tape which contained the relevant data necessary to automate the process. The following actions were taken by SD personnel to develop the tape:

- The Contract Status File (CSF), an existing sequential file, was used to extract National Item Identification Number (D046D), unit of issue (C005), reference number (D001), purchase quantity (L023), unit price (L025), contract identification numbers (L001A), design manufacturer (C035A), and previous supplier (C035) data. A modifiable utility program was used to develop/extract the CSF output.

- The IBMBX1 (BX1), a sequential file, was compared against the above mentioned CSF output to retrieve the item name (C004), acquisition method code/suffix (D025E/F), contract procurement lead time forecast (B011A), family group code (C001A), and family relationship code (C001B). A utility program was used to make the comparison, develop the program, and run it against the CSF.

- The Inventory History File (IHF), a sequential data set, was accessed to obtain demand data. Two COBOL programs were developed to retrieve nine quarters of demand history data; one program pulled eight quarters (FY 87 and FY 88) and one program pulled the first quarter FY 89. These two data sets were then matched and merged into one IHF output.

- The Master Information File - Master Data File (MIFMDF), located in the IBM database, was used as a source for: NIIN (D046D), procurement number code (C038), type of number code (D027), contract procurement lead time (B010), supply management review code (D136), item program status code (D031C), and automated purchase special procedure code (F024). CULPRIT programs were used to extract the data. A COBOL program was also required to obtain the procurement lead time (B011A less B010).

- The CSF output was used as the driver to match and link data from the BX1, the IHF and the MIFMDF outputs. Three utility programs were developed to carry out this procedure.

The numbers contained in parenthesis after each data element are Data Element Numbers (DENs). A DEN identifies where the data is located in the UICP computer file.

After developing the work tape, which was actually a DSS database, a software package which was capable of being modeled to pick inventory items (given a decision criteria) was selected. Table IV is a list of representative general purpose DSS packages.

Based on the ready access of a mainframe computer and program resources made available to the author, the Statistical Analysis System (SAS) Software was chosen for the IDTC/requirements contracts Decision Support System.

TABLE IV

GENERAL PURPOSE DSS PACKAGES

DSS PACKAGE	VENDOR	SYSTEM
Executive Information System (EIS)	Boeing Computer Services	Mainframe
Express	Tymshare	Mainframe
IFPS*	Execucom Systems	Mainframe
IFPS/Personal	Execucom Systems	Microcomputer
SAS**	SAS Institute	Mainframe
SAS/GRAPH	SAS Institute	Mainframe
SAS/PC	SAS Institute	Microcomputer

* Acronym for Interactive Financial Planning System
** Acronym for Statistical Analysis System
Source: Financial Management Theory and Practice
Eugene F. Brigham and Louis C Gapenski

C. USING THE SAS IDTC/REQUIREMENTS CONTRACTS DSS

The problem that is addressed by this DSS is one of selecting IDTC/requirements contracts candidates from a large inventory. To address this problem, the following DSS database variables were considered to be relevant:

- NIIN
- Nomenclature
- Acquisition Method Suffix Code
- Quarterly Demand

- Annual Demand
- Unit Price
- Family Group Code
- Family Relationship Code
- Procurement Admin Lead Time
- Program Management (PGM) Status Code.

The NIIN and Nomenclature were considered to be necessary for identification of the candidates once they were selected. The Acquisition Method Suffix Code was used to provide a means for determining whether an item was design stable. An AMSC code of "Y" indicates design instability. Thus any item with an AMSC not equal to "Y" was considered as design stable. However, if an item has an AMSC of "C" (critical source code item), design stability can only be determined by a manual technical review. This would be accomplished after an item has been determined otherwise to be a good candidate.

Quarterly demand data provided the basis for determining whether the essential elements, recurring demand and stable demand exist. The SAS program was used to calculate statistical variability measures (mean, standard deviation and coefficient of variation) on the quarterly demand data provided for each item.

The stability of demand was determined by using a statistical concept called the Coefficient of Variation (CV)

which is calculated by dividing the standard deviation (σ) of quarterly demand by the average quarterly demand ($\bar{X}$).

The Coefficient of Variation is a meaningful way of comparing demand variability of inventory items when there are significant differences in the magnitude of their quarterly demands. For example, assume that two inventory items (A and B) have average quarterly demands of 500 and 5000 respectively; and a standard deviation of demand during the nine quarters of 250 for item A and 2500 for item B. The Coefficient of Variation (CV) would be the same for each item, which is

$$0.5 \ (CV = \frac{\sigma}{\bar{X}} = \frac{250}{500} = \frac{2500}{5000} = 0.5).$$

It is conceivable that the amount of variability in the "expected demand" that a contractor would be willing to accept would depend upon production facilities and flexibility in scheduling/cost of production resources (i.e., raw materials, labor, quantity discounts, etc.). Further, if the contractor's production resources (facilities, equipment, etc.) used to manufacture each item have been scaled to provide an efficient output at the expected demand level, then the risk impact of the variation of demand of two items with the same coefficient of variation would be the same. Thus, a coefficient of variation also normalizes the variation with respect to demand quantity differences.

The closer a coefficient of variation is to zero (indicating low variability), there is less risk to a contractor in terms of demand fluctuations. This concept is also commonly used by investors in the stock market to assess the risk involved in an issue of a company's common stock. The lower the coefficient of variation, the less risky the stock [Ref. 24:p. 179].

The contract dollar value threshold was determined by first calculating the average quarterly demand and then multiplying it by four to arrive at the average annual demand (which is also the Best Estimated Quantity). The annual demand was then multiplied by the most recent unit price to obtain the annual contract dollar value. A minimum value of $100,000 was set in the program to discriminate against items not meeting this value. The basis behind this value was explained in Chapter IV.

To determine whether or not a program was stable, the SAS program was directed to select only those items with a Program Management (PGM) Status code of "OA." The PGM code OA means that a program has been active and operations are expected to continue into the future [Ref. 25:p. 0031C(1)].

Resident in the IBMBX1 file are data elements for family group codes and family relationship codes. A family group code identifies a family, and within a family, a group of related items which may, under specific conditions, be

substituted for one another and under which demand and/or assets may be consolidated for requirements determination. The Family Relationship Code indicates the relationship of an item to the family with which it is associated i.e., either head of the family or member of the family [Ref. 25:pp. C001A-C001B].

Family group candidates were chosen by first selecting those inventory items which met the other essential elements (i.e., demand stability, design stability, stable program) but not the contract dollar value threshold. A new data set was developed which contained these items. Next this new data set was sorted by family group code (primary sort key) and supplier (secondary sort key). For each family group/supplier combination, the annual contract dollar value of each NIIN in the group was summed and the whole family was selected if the dollar value was at least $100,000 and no individual NIIN's contract dollar value was less than $25,000. This model was not included in the final DSS output presented later in this chapter as a result of numerous missing entries in the Family Group Code (C001A). Because family grouping is a new approach at ASO, entries in this DEN are being made as family group relationships are identified.

Another approach for identifying family groups is to use "generic family grouping" by nomenclature and supplier. With this approach the same steps as described above were taken

with the exception that the sorting was by suppliers as the primary sort key and item nomenclature (e.g., vanes, propellers, blades, etc.) as the secondary sort key. The program was then directed to sum the annual contract dollar amounts for items with the same nomenclature and supplied by the same vendor. Those combination of items which met the $100,000 threshold as a group (with no single item in the group having a contract value less than $25,000) were selected.

The last factor, although not an essential element which the IDTC/requirements contracts DSS considered, was the existing PALT for each item. The Commanding Officer of ASO has set a goal of a maximum of 150 days procurement administrative lead time [Ref. 4]. Only those inventory items with a PALT of greater than 150 days were considered by the DSS. This step allows ASO's management to place emphasis only on those candidates whose PALT were outside of this goal.

D. IDTC/REQUIREMENTS CONTRACTS DSS MODELS

The IDTC/requirements contract DSS uses three models:

- Full Model: the entire data set is screened against a defined criteria
- Family Group Model: a data subset is screened for family related items
- PALT Reduction Model: PALT reductions are calculated based on given Delivery Order Lead Times (DOLT).

Figure 8 is a logic diagram of the Full Model. The Full Model takes into account all of the selection criteria, except the feature of family grouping which is considered in the Family Group Model. The Family Group Model uses the same selection criteria as the Full Model with the exception of a different contract dollar value threshold. Figure 9 presents a flow path of events that occur in the Family Group "Generic" Model.

The PALT Reduction Model adds two additional variables to the Full Model: Delivery Order Lead Time (DOLT) and a percent PALT Reduction variable. DOLT is the amount of time it takes to place a delivery order against an IDTC contract. PALT Reduction is the percentage reduction in administrative lead time achieved by using delivery orders instead of renegotiating a new contract. The PALT Reduction is calculated as follows:

$$\text{PALT-Reduction(Percent)} = \frac{\text{PALT - DOLT}}{\text{PALT}} \times 100$$

The PALT included in the calculation is the MIFMDF file PALT recorded for each inventory item. The Average Delivery Order Lead Time varies at different contracting activities. Currently, at ASO, this time is estimated to be 45 days [Ref. 12]. The output of this model is in a matrix format, providing the ranges of PALT reductions which each successful

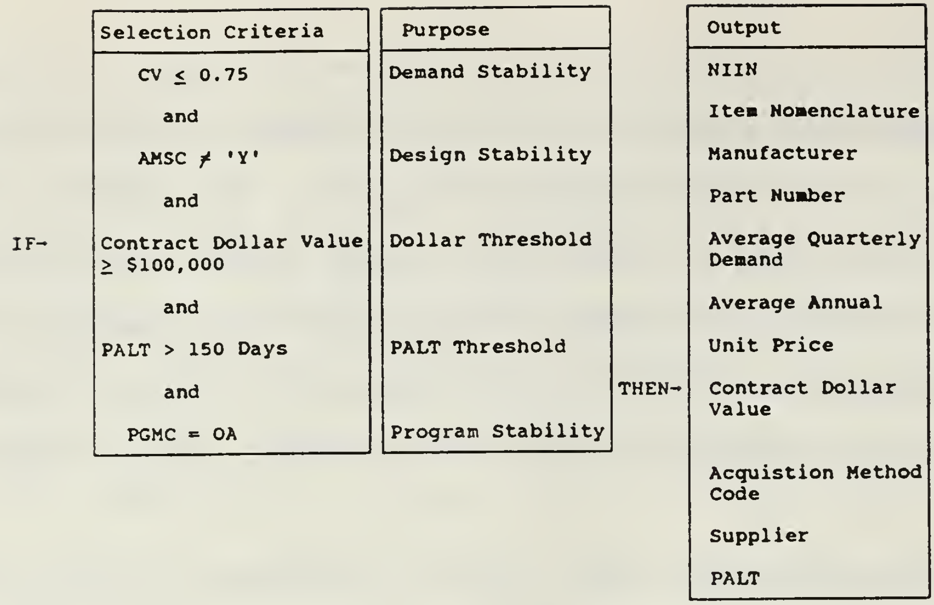

Figure 8. Logic Diagram of IDTC DSS Full Model
Source: Developed by Author

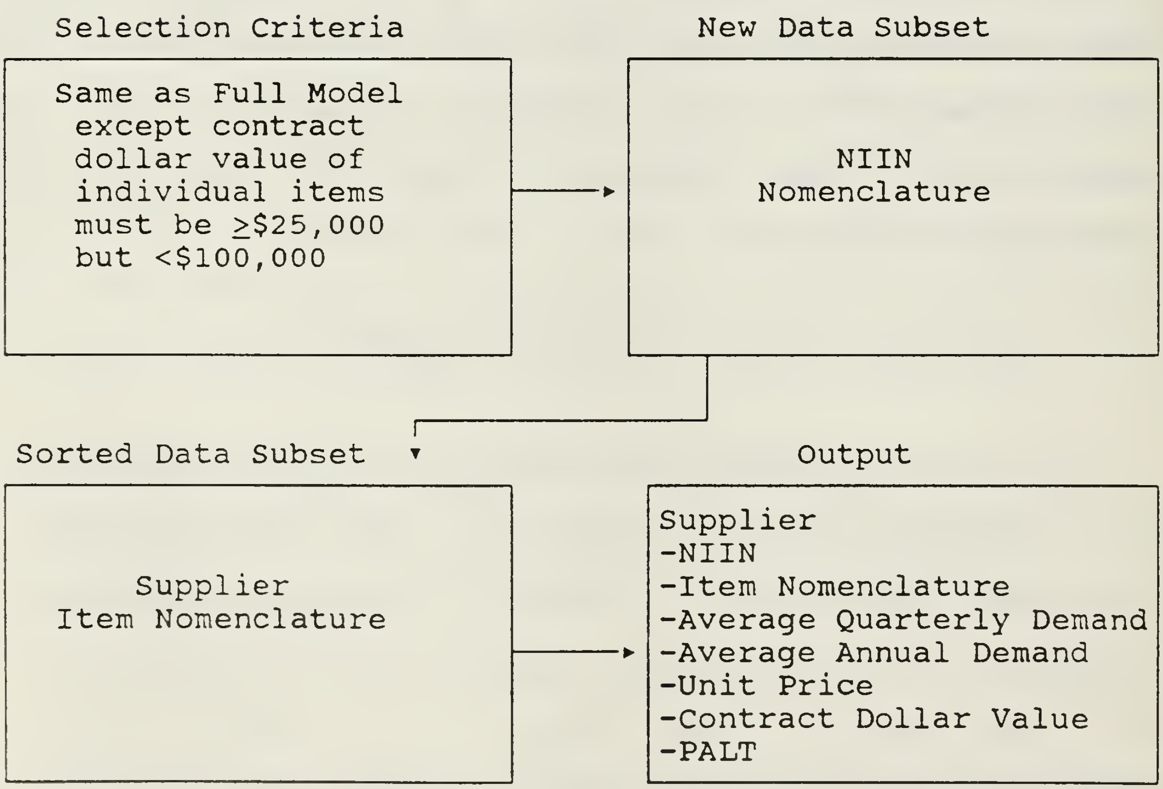

Figure 9. IDTC/Requirements Contracts Family Group "Generic" Model

candidate falls in. The matrix output for this DSS data set is provided and explained in the next section of this chapter.

E. ASSESSMENT OF THE MODELS

1. Full Model

Appendix F contains the program, explanations of the program steps, and excerpts from the output generated by the Full Model.

The model selected 2696 inventory items which met the criteria for an IDTC/requirements contract and produced a listing of these items. The candidates were chosen from a universe of 12,933 line items indicating a 20.9 percent selection rate.

A coefficient of variation equal to 0.75 was used for assessing the models. This value was chosen because the demand profile that corresponds to this coefficient of variation would provide, on the average, a minimum order quantity of not less than 25 percent of the anticipated quarterly demand and a maximum order quantity of 175 percent of the anticipated demand. For example, if the anticipated average quarterly demand was equal to 100, then with this coefficient of variation, a contractor could reasonably expect quarterly orders to range from 25 items up to 175 items. This virtually guaranteed minimum order quantity should be sufficient to entice a contractor to accept a IDTC/requirements contract.

In addition, Table VIII in Appendix F points out that 92.3 percent (2489) of the selected candidates had an average quarterly demand of between 0 and 399. If the class mark of 200 could be used as the average quarterly demand for this range, the quarterly demand would range between 50 and 350 items.

Another interesting observation about these candidates is contained in Table IX in Appendix F. The table shows a frequency distribution of the coefficient of variations. For a coefficient of variation between 0 and .50, 1130 candidates would be selected. Thus, even if the supplier of these items were risk averse and the very restrictive coefficient of variation threshold of $\leq$0.50 was used, a significant number of candidates would still be selected.

However, on the other hand, if industry would accept a coefficient of variation of 1.0, 4299 candidates would be selected. Thus, as discussed earlier, demand stability, which is indicated in the models by the coefficient of variation, is the most sensitive factor in the candidate determination process.

Figure 10 in Appendix F is a partial listing of the candidates selected. The complete listing of the candidates is the most significant product provided by the DSS. It is these items that ASO logistics managers should focus attention on awarding IDTC/requirements contracts.

2. Family Group Model

The Family Group Model utilized the same constraints as the Full Model with the exception of the contract dollar value threshold ($25,000 to $99,999). Figure 11 in Appendix G provides a partial output of the Family Group Model.

To determine family grouping, the DSS grouped together items with the same "generic nomenclature" for each supplier (AFSCM) and produced a listing of the groups. By summing the contract dollar value for each group, additional candidates are selected when the $100,000 threshold is met as a group. Because of the limited number of items which met the Family Grouping criteria (218), the items were manually grouped. However, the DSS is capable of carrying out this action. It was not used as a result of errors generated from multiple contract values being listed for each NIIN. This problem was caused by using the Contract Status File as the driver for merging the various ASO UICP files.

The number of multiple contract values corresponds to the number of contracts awarded for the item during the period of the study. If the DSS Family Group Model was used to sum the contract values of a group of items under this condition, the multiple contract values for each item would be included in the sum. This would exaggerate the "group contract dollar value" and provide erroneous results. Additional efforts have to be exerted to determine the appropriate "driver" which would not cause this problem.

By a manual grouping of items, 27 candidates were identified. For example by looking at the partial output listing provided in Figure 11 in Appendix G, the item Gasket, identified by NIINS 00-135-9572 and 00-895-0957, would be selected as good candidates. Thus, these two items would be purchased on a single contract.

3. PALT Reduction Model

The concept behind the PALT Reduction Model is to give logistics managers a tool for determining the "payoff" associated with a particular Average Delivery Order Lead Time for a contracting activity, when compared to the current PALT for the selected candidates. Table X in Appendix H provides such a tool. The table compares DOLT (in days) to PALT Reduction (in percent decrease).

To interpret the data in the table, first select the average DOLT for the contracting activity. Then read across the row for the number of candidates which would experience the percent reductions in PALT indicated by the ranges across the top of the columns.

For example, if the activity's average DOLT was 45 days (as it is at ASO), 9 of the 2696 candidates would experience a PALT reduction of between 70 to 79 percent. Likewise, 595 and 2092 of the items would have PALT reductions of between 80 to 89 percent and 90 to 100 percent respectively. Obviously, the lower the DOLT, the greater the overall PALT reduction.

The ideal situation is to automate the generation of Delivery Orders to obtain the lowest DOLT. The Air Force has implemented an Automated Delivery Order (ADO) program to reduce DOLT to a minimum [Ref. 21:p. 42]. DLA has done the same with its POPS contracts.

Automated Delivery Orders can also be accomplished at ASO by utilizing the automated purchasing features already provided in the UICP computer system. Delivery Orders for IDTC/requirements contracts could be automated at ASO by placing the code "A" in the Automated Purchase Special Procedure Data Element (F024) located in the MIFMDF data file. This code would flag the item during the Supply Demand Review Program for automated procurement.

Automation has a significant effect on DOLT. For IDTC/requirements contracts under the Air Force's ADO program, an average 10 day DOLT is experienced [Ref. 21:p. 47]. The DLA POPS contracts have an approximate 2 to 3 days DOLT depending on the day of the week that the program is run [Ref. 26].

4. Overall Assessment

During numerous test runs of the DSS, more efficient program steps were developed to reduce the amount of computer resources required, as well as to streamline the outputs.

Not only is the DSS capable of screening multi-thousand line item inventories, but it does it with tremendous accuracy and speed. Humans under the most ideal conditions

would have considerable difficulty in matching its capabilities and efficiency.

VI. CONCLUSIONS AND RECOMMENDATIONS

A. PREFACE

During this research effort, the author attempted to answer the primary question: To what extent could PALT be reduced at ASO by the expanded use of IDTC/requirements contracts? It became obvious, to answer this question a determination had to be made first regarding how might ASO expand the use of this contract type.

Discussions with knowledgeable logistics managers at various DOD ICPs and Industry Representatives indicated that IDTC/requirements contracts are a special breed of contracts which are not suitable for all inventory items. The key factor in expanding their use was determined to be the Candidate Selection Process.

After a comparison of the various methods used by DOD ICPs to determine candidates, seven essential elements were identified as being critical for the selection of good candidates. These elements were listed in Chapter IV.

Finally, to allow for the maximum use of IDTC/requirements contracts, an Automated Decision Support System was developed to provide the capability of screening a large inventory for appropriate candidates.

The outputs created by the Decision Support System indicate that there is a significant potential for positively

impacting PALT at ASO by the expanded use of IDTC/requirements contracts. The magnitude of this impact is contained in the following conclusions.

B. CONCLUSIONS

1. Conclusion I

There is a significant potential for reducing PALT at ASO by the expanded use of IDTC/requirements contracts. More specifically, PALT for the inventory items included in this study can be decreased by as much as 19% by the use of IDTC/requirements contracts. The derivation of this percentage is provided in Table V.

If this data set is indicative of the total ASO inventory, overall PALT could also be reduced by approximately the same percentage providing all potential candidates are placed on IDTC/requirements contracts. This number was calculated as follows:

- During FY 88 the average PALT for the 252,000 items managed by ASO was 386 days [Ref. 4]

- The DSS determined that the average PALT for the 12,933 items included in this study was 591 days

- For overall PALT to be 386 days and the data set PALT to be 591 days, PALT for the items which were not included in this study (252,000 - 12,933 = 239,067) was calculated to average 375 days

- Since the data set included in this study was 1/20th of the total inventory, and assuming that the same proportion of candidates would be chosen from the remaining inventory, it would be possible to have 53,920 (2,696 candidates X 20) line items on IDTC/requirements contracts. This volume of IDTCs would lead to a 19.8% reduction in the overall PALT or a PALT of approximately 310 days.

TABLE V

CALCULATION OF IDTC/REQUIREMENTS CONTRACTS IMPACT ON PALT

Step	Action	Method	Results
1	Determine the PALT for the entire data set	DSS	560 days
2	Determine the number of line items included in data set	DSS	12,933
3	Determine the number of good candidates	DSS	2,696
4	Calculate the new PALT	Manual	453 days

Let N = # of Inventory items = 12,933
Let S = # of successful candidates = 2,696
Let AP_0 = Initial PALT for all inventory items = 560
Let AP_1 = PALT if maximum use of IDTC/requirements contracts
Let PR = PALT Reduction (percent)

$$AP_0 = \frac{N \times AP_0}{N} = \frac{(N - S)\ AP_0 + S\ (AP_0)}{N}$$

$$= \frac{(12,933 - 2,696)\ 560 + 2,696\ (560)}{12,933}$$

AP_0 = 560 (provided by the DSS)

$$AP_1 = \frac{(N - S)\ AP_0 + S\ (DOLT)}{N}$$

$$= \frac{[(10,237)\ 560] + [2,696\ (45)]}{12,933}$$

AP_1 = 453 days

$$PR = \left[1 - \frac{AP_1}{AP_0}\right] \times 100$$

$$= \left[1 - \frac{453}{560}\right] \times 100$$

= 19.2%

Source: Developed by Author

2. Conclusion II

For PALT to be reduced to the 150 days ASO goal by the expanded use of IDTC/requirements contracts alone, approximately 175,000 line items would have to be placed on IDTC/requirements contracts. To achieve this volume suppliers would have to be willing to accept demand variability up to a coefficient of variation equal to 3.0. Based on the current Government/Industry relationship in defense procurement, the author feels that industry would not be willing to accept this degree of risk.

3. Conclusion III

The use of the IDTC Decision Support System developed in this study should result in significant dollar savings in terms of the reduction in safety stock associated with a 19 percent reduction in PALT. The average purchase price of an inventory item in this data set is $251,176. Thus for each unit reduction in safety stock, a stock fund savings of approximately $250,000 would be realized. Additionally, productivity increases resulting from a reduction in the time logistics managers spend on selecting candidates would be added benefits.

C. RECOMMENDATIONS

1. Recommendation I

ASO should develop work tapes of the entire inventory and run the DSS against these items to develop a complete list of candidates.

2. Recommendation II

ASO should take the output listing produced by the DSS Full Model in this study and immediately conduct a technical analysis to determine if the design parameters of the items have changed since the data were loaded into the computer files. A detailed screen of Acquisition Method Suffix Code "C" items should also be conducted to determine that they are in fact design stable.

3. Recommendation III

After the items have been technically screened by the Equipment Specialist, the revised candidate listing should be provided to the Item Managers for use when the SDR program triggers a buy recommendation.

4. Recommendation IV

ASO should also conduct advance communication with potential suppliers, explaining the anticipated requirements, the intention to use Indefinite Delivery Type contracts, and the procedure used to determine the candidates. A notice in the Commerce Business Daily might be appropriate to initiate the communication. A letter forwarded to potential suppliers may also be a suitable method.

5. Recommendation V

The Commander, Naval Supply Systems Command should assess the model for application at the other Navy ICPs and at Navy Stock Points.

6. Recommendation VI

Air Force, Army and DLA ICPs should utilize ASO as the lead ICP for full scale implementation since the ASO computer systems developers are already familiar with data requirements and software tools needed to extract and merge the data into a work tape.

7. Recommendation VII

Each ICP/stock point should, if practical, review the pertinent data elements needed to run the DSS and conduct file maintenance where necessary to allow full utilization of the models.

8. Recommendation VIII

Although the focus of this study was narrowed to address only IDTC/requirements contracts the DSS is equally applicable to all three types of IDTCs. Thus DOD ICPs and Stock Points should make use of the DSS for identifying IDTC candidates in general.

D. RESEARCH QUESTIONS

1. Primary Research Question

To what extent can Procurement Administrative Lead Time (PALT) for inventory items managed by the Navy Aviation

Supply Office (ASO) be reduced by an expanded use of IDTC/requirements contracts?

By generalizing the output generated by the Decision Support System across the entire inventory, PALT can be reduced by approximately 19 percent if the maximum number of candidates are placed on IDTC/requirements contracts. The calculations for this figure were presented earlier in Conclusion I.

This magnitude of reduction has significant positive implications not only in terms of reduced funding required for safety stock, but also for <u>improved fleet readiness</u> which is the bottom line nature of the DOD ICP business.

The ICPs that were included in this study all indicated efforts to expand the use of IDTCs. This DSS provides an important <u>management assistance tool</u> to accomplish that goal in the most effective and efficient manner.

2. Subsidiary Questions 1 and 2

What are the conditions necessary for IDTC/requirements contracts to be successfully used?

What are the essential elements of a model which could be used to identify those ASO managed items which are good candidates for requirements contracts?

The Federal Acquisition Regulation provides the basic guidance for selecting IDTC/requirements contracts candidates. Each service has amplified this guidance by publishing an IDTC Guidebook.

A review of the guidance promulgated by each of the services and through surveys/discussions with key logistics managers and industry representatives, the following seven condition/elements were determined to be critical for selecting IDTC/requirements contracts candidates:

- Recurring demand
- Stable demand pattern
- Stable design
- Stable program
- Contract dollar value for single NSN contracts $\geq$\$100,000
- Contract dollar value for multiple NSNs on a single contract $\geq$ \$100,000 as a group with no single NSN contract value < \$25,000
- A willing industry to accept this contract type.

Of all the elements, stable demand was determined to be the most critical from an industry acceptance perspective and the most sensitive variable in each of the DSS models. Changing the coefficient of variation (measure for demand stability) by $\pm$ 33% (0.75 $\pm$ .25) leads to a change in candidates by at least $\pm$ 42 percent respectively.

3. Subsidiary Question 3

What is the feasibility of developing an Automated Decision Support System for identifying candidates for IDTC/requirements contracts?

The results of the research revealed that not only is it highly feasible to develop a DSS, but one was actually developed and used to produce outputs for this report.

Although missing data for the Program Management Status Code (PGMC) and duplicate NIINs (Family Grouping) precluded the full use of the DSS, these problems only slightly degraded the capabilities of the models.

This IDTC/requirements contracts Decision Support System should prove to be a tremendous benefit throughout DOD ICPs and Stock Points.

E. RECOMMENDATIONS FOR FURTHER RESEARCH

Research conducted for this study has identified the following areas for further study:

1. Recommendation I

Further research should be conducted to determine the total cost and benefits of using this DSS with particular emphasis on the cost to correct file maintenance problems and the benefits associated with reductions in safety stock.

2. Recommendation II

Additional research should be conducted to determine the applicability of using this DSS with the new Inventory Control Programs being installed at Navy ICPs and Stock Points.

3. Recommendation III

Research should be conducted to develop a personal computer version of this DSS to allow use by those activities that do not have ready access to a mainframe computer.

APPENDIX A

QUESTIONNAIRE

1. Have you or your activity conducted any studies or experiments on the impact of using "requirements contracts" to reduce PALT? (If possible, please provide a copy of any documentations of the studies/experiments, results, lessons learned, etc.).

2. To what extent have requirements contracts been/currently being used i.e. how often, for what commodities, etc.? (If possible please provide statistical data for FY 87 & 88)

3. What methodology do you / your activity use to determine which items or services should be procured using a requirements contract i.e. committee, task group, etc.? (Please explain how the method was determined; how the determination process is carried out; strengths and weaknesses of the process, etc.).

4. What do you think are the essential elements or characteristics that should exist for an inventory item to be procured using a requirements contract, e.g., recurring demand,etc.?

5. How might an inventory manager or procurement specialist determine that the essential elements identified in question 4 exist for a particular inventory item (e.g., recurring demand from the Inventory History File)?

6. Other Comments:

APPENDIX B

DECISION MATRIX

Steps to take to aid in achieving the optimum contracting approach for items.

STEP 1. Determine if the item must be purchased from a mandatory source of supply.

YES 1. FSS Source - When it is determined that the FSS source of supply is the preferred source for specified items (i.e. the contracting officer would award to the FSS source under manual procedures), or when DOD is still considered a mandatory user, those sources should be identified and entered in the Advance Agreements Master File (AAMF) to initiate the Computer Generated Delivery Orders (CGDO): or

2. NIB/NISH/FPI - Determine if a long term contract arrangement is appropriate. If so research using the Advance Agreement CGDO program to automate the agreement: or

3. Other mandatory sources - exclude those items covered by other mandatory sources of supply.

NO Go to step 2.

STEP 2. Determine which items are anticipated to be purchased using small purchase procedures (under $25,000)

YES - Either:

1. Establish a BPA with all vendors able to supply the items/services; and

2. If requirements are anticipated to be $2,500 or less per call, establish a SPEDE agreement with the BPA holder: or

3. Establish an Indefinite Delivery Type Purchase Order (IDTPO)

NO Go to step 3.

STEP 3. Refer to table 1 to identify the long term contracting approach that may be appropriate for the item/service being reviewed.

Table 1. (Step 3. continued) General requirements for using long term contracts.

TABLE VI

DLA LONG TERM CONTRACTS
SELECTION CRITERIA

CONTRACT TYPES	MULTI YEAR	RTC-MULTI YEAR	IQC	RTC	OPTION TERM	OPTION QTY
CRITERIA						
STABLE RQMTS	YES	YES				
REALISTIC ESTIMATES	YES	YES	YES	YES	YES	YES
REQUIRED MINIMUM	YES	YES	YES			
STABLE DESIGN	YES	YES	YES	YES	YES	YES
STABLE FUNDS	YES	YES				
AUTOMATION						
POPS		YES	YES	YES		
COPAD		YES	YES	YES		
ADVANCE AGREEMENT		YES	YES	YES		

Source: DLA Long Term Contracting Guide

The table provides general guidelines for selecting items for long term contracting. Individual criteria can be broken down and analyzed with more detail. The detailed analysis identifies specific parameters that are required for specific types of contracts. For example, a realistic estimate of future demands is required for all types of extended contractual coverage. However, the importance of this criteria varies depending on the type of contract. Under a

multi year contract, if a cancellation ceiling is incorporated in the contract, it is critical to correctly identify anticipated quantities. Whereas under an RTC, the obligation is limited to actual requirements, so while the estimates are still considered important, the government will generally not suffer a loss as a result of an unrealistic estimate.

Go to step 4.
STEP 4. In addition to and concurrent with step 3, is a review for the application of techniques that may be employed to enhance long term contracting efforts. Table 2 provides general guidelines on which office is responsible for initiating action for use of the techniques.

TABLE VII

OFFICES RESPONSIBLE
FOR
PROCUREMENT GROUP CODING

OFFICE OF PRIMARY INTEREST	PROCUREMENT GROUP CODES	ECONOMIC ORDER QUANTITY	INCREMENTAL BIDDING PROCEDURES	MULTI SOURCE CONTRACT
TECH	Identify Family Groups			
SUPPLY	Develop Procedures For RBs	Use the DOD EOQ	Recommend Increments	Severable Quantities
CONTRACTS	Determine Contract Type	Collect Offeror EOQ	Solicit Using Increments	Appropri-ate Conditions

Source: DLA Long Term Contracting Guide

STEP 5. Using locally established procedures, formulate the acquisition plan, document, and carry through with the predetermined course of action.

APPENDIX C

MYC DECISION AND INFORMATION SHEET

MYC DECISION AND INFORMATION SHEET

I — MM REQUIREMENTS INFORMATION

PURCHASE REQUEST NUMBER	LINE ITEM NUMBER		NATIONAL STOCK NUMBER
AMENDMENT NUMBER	CURRENT DATE		COMPUTATION DATE
INITIATOR *(Printed Name)*	OFFICE SYMBOL	PHONE	MANAGER DESIGNATOR CODE

TYPE REQUIREMENT

☐ D039(Equipment) ☐ D041 (Recoverable) ☐ D062 (EOQ) ☐ OTHER ______

II — SELECTION CRITERIA

	NO	YES		NO	YES
UNSTABLE PROGRAM *(Explain)*	☐	☐	IMS	☐	☐
UNSTABLE DESIGN *(Explain)*	☐	☐	NSO	☐	☐
TOTAL 3 YEARS RQMT, LESS THAN $25,000	☐	☐	OTHER REASON *(Explain)*	☐	☐

III — REQUIREMENTS

QDP PR ☐ YES ☐ NO OTHER MYC CANDIDATE ☐ YES ☐ NO

FY	D039	D041	D062	AIR FORCE	FMS	OTHER SERVICE / SPECIAL PROGRAM	TOTAL
	BUY YR	AY	ROLD + EOQ				
	BUD YR	BY	ANNUAL RATE				
	BUD YR + 1 YR	EY	ANNUAL RATE				

MINIMUM ORDERING QUANTITY	MAXIMUM ORDERING QUANTITY	TOTAL 3 YR RQMT = (BEQ)

TOTAL CONTRACT MAXIMUM QUANTITY ______ $ ______

QDP INFORMATION 1ST QTY ______ 2ND QTY ______ 3RD QTY ______ $ ______

MM REMARKS / JUSTIFICATION

IV — PM CONTRACTING INFORMATION

CONTRACT AWARDED ☐ CLASSIC ☐ EXPANDED ☐ FIXED QTY ☐ IQ ☐ OPT ☐ QDP ☐ RQMTS

CONTRACT NUMBER	DOLLARS OBLIGATED	TOTAL AMOUNT OF CONTRACT	COST AVOIDANCE

V — REASON WHY NO MYC *(Must be explained in PM Remarks)*

☐ CONTRACTOR REFUSAL ☐ NOT QDP / MYC CANDIDATE ☐ OTHER *(Explain)*

PM REMARKS

BUYER *(Printed name)*	OFFICE SYMBOL	PHONE	DATE	BUYER CODE	CAGE CODE

APPENDIX D

REQUIREMENTS CONTRACT CANDIDATE WORKSHEET

Date________________

PR Number________________ Item Manager_______________

Code_______________

NSN_______________________ Telephone Extension_______

Estimated total quantity to be ordered in a 12 month period (would span two fiscal years):

____

Maximum or minimum quantities that would be ordered under each individual order:

Max__________________

Min__________________

It is recommended this procurement be awarded using a requirements contract. Recurring requirements are anticipated for this item during the period of the contract. The design of this item is stable.

_____________________________ _____________ ___________

Weapons Manager Code Date

APPENDIX E

QUESTIONNAIRE

1. What are the essential conditions that must exist for   to be willing to accept a requirements contract for government spare parts purchases?

2. To what extent is demand stability (i.e., a recurring demand and/or stable demand) a factor in   's willingness to accept requirements contracts?

Great_______ Moderate________ Not A Factor_________

Please comment:

3. To what extent is design stability a factor in   's acceptance of requirements contracts?

Great_______ Moderate_______ Not A Factor______

Please comment:

4. The below listed items which manufactures are being or have been purchased by the Navy Aviation Supply Office. Please indicate whether or not a requirements contract would be accepted for the item considering the anticipated quarterly requirement, variation in quarterly requirement, and total annual requirement provided. If a requirements contract would not be accepted, please indicate the reason.

NIIN PART NR.	ITEM	REQUIREMENT		
		QUARTER	VARIATION	ANNUAL

A.

Accept______ Would not accept_________
Reason for not accepting:

B.

Accept______ Would not accept__________
Reason for not accepting:

C.

Accept_____ Would not accept__________
Reason for not accepting:

D.

Accept______ Would not accept__________
Reason for not accepting:

5. For the items above that a requirements contract would be acceptable, would be willing to negotiate option periods? If so, how many?

Item

A. 1 _____ 2 ______ 3 _______ None _______
If none, please explain reason:

B. 1_______ 2 ________ 3 _______ None ________
If none, please explain reason:

C. 1_____ 2 ________ 3_________ None __________
If none, please explain reason:

D. 1 _____ 2 _______ 3 _________ None __________
If none, please explain reason:

6. What general categories of items which manufactures that you feel would be good candidates for requirements contracts?

7. Additional comments:

APPENDIX F

FULL MODEL

Explanations

DATA IDTC:	Tells SAS that data will be read in and to put the data into a SAS data set named IDTC.
INFILE RSP89:	Tells SAS the data to be read is located in an external file named RSP89.
INPUT:	Reads in the data from the external file, names the variables, and gives the variables column locations. The dollar sign ($) indicates that the variable is a character variable. No dollar sign indicates a numeric variable.
LABEL:	Gives user defined labels for the variables.

New Variables not included in the original data set.

Dem_Mean:	Average Quarterly Demand.
Dem_SD:	Standard deviation of the Quarterly Demand.
COEF_VAR:	Coefficient of Variation of Quarterly Demand.
ADJ_PALT:	PALT converted to days (provided in the original data set in calendar quarters).
DOLT:	Delivery Order Lead Time
PALT_RED:	PALT Reduction (percent decrease).
ANN_DEM:	Average Annual Demand (BEQ).
ANN_RQT:	Average Annual Contract Dollar Value.

DATA, DATA 1, DATA 2, DATA 3, DATA 4:

Creates four (4) new data subsets (DATA 1, DATA 2, DATA 3, DATA 4). These data subsets allow the large data set RSP89 to be processed in blocks. This procedure speeds up processing time and reduces the amount of computer memory needed to process the data.

SET IDTC: Tells SAS the data to be input is located in data set IDTC.

If statements are the IDTC/requirements contracts selection criteria:

Design Stability: An AMSC = Y indicates design instability, thus, the program looks for items with an AMSC not equal (NE) to "Y".

Contract Dollar Value Threshold (>$100,000).

Zero demand items are removed from consideration.

Demand Pattern: The closer the Coefficient of Variations is to zero, the more stable the demand pattern. (This setpoint is determined by management after a vendor survey and technical review).

If the PALT is less than or equal to this value, the item is discriminated against as a candidate. The value selected is the maximum PALT goal set by the activity.

Note: The DSS is designed to consider Program Stability at this point. The program step would be "if PGMC = OA". This step tells SAS to consider only those items which have a Program Management Status Code equal to OA which means a stable program. Because of the large number of items with missing PGMC data entries, this discriminant was not used for this test of the model.

CHAR STATEMENTS: Defines for SAS which items are to be included in each data subset. These steps break up the data in four approximatly equal blocks.

PROC SUMMARY: Summarizes the data in the four subsets.

DATA NIINGRP: New data set NIINGRP is created.

Outputs from the four data sets are inputs into the new data set, NIINGRP. These items are the selected candidates.

PROC SORT:	Sorts the new candidates by NIIN.
PROC PRINT:	Produces a printout of the selected candidates.
PROC FORMAT:	Establishes the format for frequency tables.
PROC FREQ:	Tells SAS to produce frequency tables.
TABLES:	Tells SAS to produce frequency tables with variables, coefficient of variation, and quarterly demand.
FORMAT:	Instructs SAS to use the format established by the PROC FORMAT command.
TITLE:	Gives the Frequency Tables a title.
DATA FULLMODL:	Creates data subset FULLMODL.
MERGE:	Merges data subsets IDTC and NIINGRP.
PROC UNIVARIATE:	Instructs SAS to conduct detailed statistical calculations on the variables listed.
PROC FREQ/TABLES:	Instructs SAS to develop frequency tables for variables listed.
/*:	Tells SAS that this is the end of the program.

FULL MODEL PROGRAM STEPS

```
DATA IDTC;
INFILE RSP89;
INPUT NIIN      $ 1-9
      ITEM      $ 10-28
      UNIT      $ 29-30
      CODENUM   $ 31
      CODETYPE  $ 32-33
      DFSCM      $ 34-38
      REFNUM    $ 39-58
      DEM_1_87    59-66
      DEM_2_87    67-74
      DEM_3_87    75-82
      DEM_4_87    83-90
      DEM_1_88    91-98
      DEM_2_88    99-106
      DEM_3_88    107-114
      DEM_4_88    115-122
      DEM_1_89    123-130
      AMC       $ 131
      AMSC      $ 132
      PUR_QTY     133-140
      UNIT_PRI    141-149
      TOT_PRI     150-160
      PALT        161-164
      PIIN      $ 165-183
      FGC       $ 184-187
      FRC       $  188
      AFSCM     $ 189-193
      SMRC      $ 194
      PGMC      $ 195-196
      APC       $ 197;
LABEL
      NIIN        ='NATIONAL ITEM IDENTIFICATION NUMBER    '
      ITEM        ='NOMENCLATURE                           '
      UNIT        ='UNIT OF ISSUE                          '
      CODENUM     ='PROCUREMENT NUMBER CODE                '
      CODETYPE    ='TYPE OF NUMBER CODE                    '
      DFSCM       ='DESIGN FSCM                            '
      REFNUM      ='REFERENCE NUMBER                       '
      DEM_1_87    ='FIRST QUARTER FY87 DEMAND              '
      DEM_2_87    ='SECOND QUARTER FY87 DEMAND             '
      DEM_3_87    ='THIRD QUARTER FY87 DEMAND              '
      DEM_4_87    ='FOURTH QUARTER FY87 DEMAND             '
      DEM_1_88    ='FIRST QUARTER FY88 DEMAND              '
      DEM_2_88    ='SECOND QUARTER FY88 DEMAND             '
      DEM_3_88    ='THIRD QUARTER FY88 DEMAND              '
      DEM_4_88    ='FOURTH QUARTER FY88 DEMAND             '
      DEM_1_89    ='FIRST QUARTER FY89 DEMAND              '
```

```
      AMC        ='ACQUISITION METHOD CODE                    '
      AMSC       ='ACQUISITION METHOD SUFFIX CODE             '
      PUR_QTY    ='PURCHASE QUANTITY                          '
      UNIT_PRI   ='UNIT PRICE                                 '
      TOT_PRI    ='EXTENDED PRICE                             '
      PALT       ='PROCUREMENT ADMINISTRATIVE LEADTIME        '
      FGC        ='FAMILY GROUP CODE                          '
      FRC        ='FAMILY RELATIONSHIP CODE                   '
      AFSCM      ='SUPPLIER                                   '
      SMRC       ='SUPPLY MANAGEMENT REVIEW CODE              '
      PGMC       ='PGM STATUS CODE                            '
      APC        ='AUTOMATED PURCHASE CODE                    '
      PIIN       ='PRIMARY/SECONDARY ITEM IDENT NUMBER        ';
DEM_MEAN= MEAN(DEM_1_87,DEM_2_87,DEM_3_87,DEM_4_87,DEM_1_88,DEM_2_88,
          DEM_3_88,DEM_4_88,DEM_1_89);
DEM_SD= STD(DEM_1_87,DEM_2_87,DEM_3_87,DEM_4_87,DEM_1_88,DEM_2_88,
          DEM_3_88,DEM_4_88,DEM_1_89);
IF (DEM_MEAN NE 0) THEN COEF_VAR=DEM_SD/DEM_MEAN;
ADJ_PALT=PALT*0.9;
DOLT=45;
IF(ADJ_PALT NE 0) THEN PALT_RED=((ADJ_PALT-DOLT)/ADJ_PALT)*100;
ANN_DEM=DEM_MEAN*4;
ANN_RQT=ANN_DEM*UNIT_PRI;
DATA DATA1 DATA2 DATA3 DATA4;
 SET IDTC;
 IF AMSC NE 'Y';
 IF ANN_RQT>=100000;
 IF DEM_MEAN NE 0;
 IF ADJ_PALT>150;
 CHAR3 = SUBSTR(NIIN,1,3);
   IF 'LLA'<=CHAR3<='002' THEN OUTPUT DATA1;
   IF '003'<=CHAR3<='008' THEN OUTPUT DATA2;
   IF '009'<=CHAR3<='010' THEN OUTPUT DATA3;
   IF '011'<=CHAR3<='998' THEN OUTPUT DATA4;
```

```
PROC SUMMARY DATA=DATA1;
   CLASS NIIN;
   VAR COEF_VAR DEM_MEAN;
   OUTPUT OUT=NIINGRP1 MEAN=MCOEF_VA MDEM_MEA;
 PROC SUMMARY DATA=DATA2;
    CLASS NIIN;
    VAR COEF_VAR DEM_MEAN;
    OUTPUT OUT=NIINGRP2 MEAN=MCOEF_VA MDEM_MEA;
 PROC SUMMARY DATA=DATA3;
    CLASS NIIN;
     VAR COEF_VAR DEM_MEAN;
    OUTPUT OUT=NIINGRP3 MEAN=MCOEF_VA MDEM_MEA;
 PROC SUMMARY DATA=DATA4;
     CLASS NIIN;
     VAR COEF_VAR DEM_MEAN;
     OUTPUT OUT=NIINGRP4 MEAN=MCOEF_VA MDEM_MEA;
 DATA NIINGRP;
 SET NIINGRP1 NIINGRP2 NIINGRP3 NIINGRP4;
 PROC SORT;
   BY NIIN;
 PROC PRINT;
PROC FORMAT;
   VALUE CVX 0 - <0.5='0.0 - 0.5'
           0.5 - <0.75='.6 - 0.75'
           0.75- <1.0 ='.76- 1.0'
           1.0 - <1.5 ='1.1 - 1.5'
           1.5 - <2.0 ='1.6 - 2.0'
           2.0 - <2.5 ='2.1 - 2.5'
           2.5 - <3.0 ='2.6 - 3.0'
           3.0 - HIGH ='>3.0';
    VALUE DM 0 - <400 = '0 - 399'
           400 -<800  = '400-799'
           800 -<1200 ='800-1199'
          1200 -<1600 = '1200-1599'
          1600 -<2000 = '1600-1999'
          2000 -<2400 = '2000-2399'
          2400 -<2800 = '2400-2799'
          2800 -<3200 = '2800-3199'
          3200 -<3600 = '3200-3599'
          3600 - HIGH = '>3600';
```

```
    PROC FREQ;
      TABLES MCOEF_VA * MDEM_MEA;
      TABLES MDEM_MEA MCOEF_VA;
    FORMAT MCOEF_VA CVX. MDEM_MEA DM.;
    TITLE 'SPEIGHTS IDTC CANDIDATE DETERMINATION MODEL';
    DATA FULLMODL;
       MERGE IDTC NIINGRP (IN=A);
       BY NIIN;
       IF A;
    PROC UNIVARIATE;
      VAR
         ADJ_PALT
         COEF_VAR
         ANN_DEM
         UNIT_PRI
         ANN_RQT;
    PROC FREQ;
         TABLES
         AMC
         AMSC
         FGC
         SMRC
         CODENUM
         CODETYPE;
/*
```

SAS

NIIN	_TYPE_	_FREQ_	MCOEF_VA	MDEM_MEA
011325861	1	1	0.552409	4.44
011341380	1	3	0.382766	84.67
011341381	1	3	0.271040	70.11
011342320	1	12	0.459734	16.11
011344415	1	1	0.598616	5.11
011345275	1	1	0.434782	17.67
011345281	1	3	0.672414	3.22
011351196	1	2	0.504969	116.67
011351434	1	4	0.487058	31.11
011351480	1	5	0.666615	2.22
011351481	1	6	0.519615	1.67
011351494	1	1	0.707107	1.00
011351512	1	9	0.435828	36.33
011351520	1	3	0.642329	496.33
011351703	1	3	0.703562	2.22
011358372	1	1	0.245140	312.00
011358373	1	6	0.593478	97.00
011358374	1	2	0.505202	99.00
011358375	1	2	0.575837	105.44
011358677	1	9	0.715553	13.78
011358682	1	1	0.621867	5.33
011358760	1	1	0.612190	4.56
011358765	1	1	0.675186	16.44
011358767	1	2	0.681818	2.44
011358780	1	10	0.614446	1141.00
011358830	1	5	0.696331	7.67
011358948	1	1	0.692806	88.11
011358990	1	4	0.662834	4.33
011359651	1	1	0.406793	31.56
011361540	1	12	0.535607	6.67
011361541	1	8	0.711279	8.67
011364250	1	7	0.551712	20.11
011364306	1	3	0.458949	445.78
011364313	1	6	0.447639	116.44
011364583	1	3	0.599671	324.44
011367797	1	3	0.499726	5141.89
011367800	1	5	0.488850	203.33
011388060	1	5	0.723561	31.33
011388079	1	5	0.736614	324.33
011388080	1	3	0.550190	450.22
011388081	1	4	0.616896	507.11
011388082	1	3	0.455641	595.33
011388098	1	2	0.723998	70.11
011392008	1	6	0.546652	1.78
011392341	1	7	0.739510	4.00
011392342	1	6	0.700071	33.67
011392343	1	4	0.551860	15.67
011395568	1	4	0.505535	236.00
011395596	1	10	0.363367	101.11

Figure 10. Full Model Output

TABLE VIII

COEFFICIENT OF VARIATION AND QUARTERLY DEMAND

MCOEF_VA MDEM_MEA

FREQUENCY PERCENT ROW PCT COL PCT	0 - 399	400-799	800-1199	1200-1599	1600-1999	2000-2399	2400-2799	2800-3199	3200-3599	>3600	TOTAL
0.0 - 0.5	1010 11.11 89.38 11.58	50 0.55 4.42 34.01	27 0.30 2.39 42.19	10 0.11 0.88 26.32	10 0.11 0.88 33.33	4 0.04 0.35 22.22	0 0.00 0.00 0.00	2 0.02 0.18 18.18	2 0.02 0.18 100.00	15 0.16 1.33 29.41	1130 12.43
.6 - 0.75	1479 16.27 94.44 16.96	31 0.34 1.98 21.09	12 0.13 0.77 18.75	12 0.13 0.77 31.58	9 0.10 0.57 30.00	5 0.05 0.32 27.78	1 0.01 0.06 11.11	4 0.04 0.26 36.36	0 0.00 0.00 0.00	13 0.14 0.83 25.49	1566 17.23
.76- 1.0	1540 16.94 96.07 17.66	27 0.30 1.68 18.37	8 0.09 0.50 12.50	7 0.08 0.44 18.42	8 0.09 0.50 26.67	1 0.01 0.06 5.56	2 0.02 0.12 22.22	1 0.01 0.06 9.09	0 0.00 0.00 0.00	9 0.10 0.56 17.65	1603 17.63
1.1 - 1.5	2087 22.96 96.89 23.93	29 0.32 1.35 19.73	12 0.13 0.56 18.75	4 0.04 0.19 10.53	3 0.03 0.14 10.00	4 0.04 0.19 22.22	4 0.04 0.19 44.44	3 0.03 0.14 27.27	0 0.00 0.00 0.00	8 0.09 0.37 15.69	2154 23.69
1.6 - 2.0	1327 14.60 98.52 15.22	6 0.07 0.45 4.03	2 0.02 0.15 3.13	3 0.03 0.22 7.89	0 0.00 0.00 0.00	2 0.02 0.15 11.11	2 0.02 0.15 22.22	1 0.01 0.07 9.09	0 0.00 0.00 0.00	4 0.04 0.30 7.84	1347 14.82
2.1 - 2.5	600 6.60 98.68 6.88	4 0.04 0.66 2.72	1 0.01 0.16 1.56	0 0.00 0.00 0.00	0 0.00 0.00 0.00	1 0.01 0.16 5.56	0 0.00 0.00 0.00	0 0.00 0.00 0.00	0 0.00 0.00 0.00	2 0.02 0.33 3.92	608 6.69
2.6 - 3.0	255 2.80 98.08 2.92	0 0.00 0.00 0.00	2 0.02 0.77 3.13	2 0.02 0.77 5.26	0 0.00 0.00 0.00	1 0.01 0.38 5.56	0 0.00 0.00 0.00	0 0.00 0.00 0.00	0 0.00 0.00 0.00	0 0.00 0.00 0.00	260 2.86
>3.0	423 4.65 100.00 4.85	0 0.00 0.00 0.00	0 0.00 0.00 0.00	0 0.00 0.00 0.00	0 0.00 0.00 0.00	0 0.00 0.00 0.00	0 0.00 0.00 0.00	0 0.00 0.00 0.00	0 0.00 0.00 0.00	0 0.00 0.00 0.00	423 4.65
TOTAL	8721 95.93	147 1.62	64 0.70	38 0.42	30 0.33	18 0.20	9 0.10	11 0.12	2 0.02	51 0.56	9091 100.00

TABLE IX

FREQUENCY TABLE - COEFFICIENT
OF VARIATION

MCOEF_VA	FREQUENCY	PERCENT	CUMULATIVE FREQUENCY	CUMULATIVE PERCENT
0.0 - 0.5	1130	12.4	1130	12.4
.6 - 0.75	1566	17.2	2696	29.7
.76- 1.0	1603	17.6	4299	47.3
1.1 - 1.5	2154	23.7	6453	71.0
1.6 - 2.0	1347	14.8	7800	85.8
2.1 - 2.5	608	6.7	8408	92.5
2.6 - 3.0	260	2.9	8668	95.3
>3.0	423	4.7	9091	100.0

APPENDIX G

FAMILY GROUP MODEL

<u>Explanations</u>

Same as the Full Model with the following exceptions:

If 25,000 < ANN_RQT < 100,000:	Sets the contract dollar value threshold.
DATA FAMILY:	Creates new data subset Family
PROC SORT:	Instructs SAS to sort data subset Family by Supplier (AFSCM) and Item (nomenclature).
DATA SORTED:	Creates new data subset Sorted.
Set FAMILY:	Puts the sorted data into data subset Sorted.
PROC PRINT:	Instructs SAS to print out the listed variables from the sorted data subset.
/*:	Tells SAS that this is the end of the program.

FAMILY GROUP MODEL PROGRAM STEPS

```
DATA IDTC;
INFILE RSP89;
INPUT NIIN      $ 1-9
      ITEM      $ 10-28
      UNIT      $ 29-30
      CODENUM   $ 31
      CODETYPE  $ 32-33
      DFSCM      $ 34-38
      REFNUM    $ 39-58
      DEM_1_87    59-66
      DEM_2_87    67-74
      DEM_3_87    75-82
      DEM_4_87    83-90
      DEM_1_88    91-98
      DEM_2_88    99-106
      DEM_3_88    107-114
      DEM_4_88    115-122
      DEM_1_89    123-130
      AMC       $ 131
      AMSC      $ 132
      PUR_QTY     133-140
      UNIT_PRI    141-149
      TOT_PRI     150-160
      PALT        161-164
      PIIN      $ 165-183
      FGC       $ 184-187
      FRC       $  188
      AFSCM     $ 189-193
      SMRC      $ 194
      PGMC      $ 195-196
      APC       $ 197;
LABEL
      NIIN        ='NATIONAL ITEM IDENTIFICATION NUMBER     '
      ITEM        ='NOMENCLATURE                            '
      UNIT        ='UNIT OF ISSUE                           '
      CODENUM     ='PROCUREMENT NUMBER CODE                 '
      CODETYPE    ='TYPE OF NUMBER CODE                     '
      DFSCM       ='DESIGN FSCM                             '
      REFNUM      ='REFERENCE NUMBER                        '
```

```
      DEM_1_87    ='FIRST QUARTER FY87 DEMAND                '
      DEM_2_87    ='SECOND QUARTER FY87 DEMAND               '
      DEM_3_87    ='THIRD QUARTER FY87 DEMAND                '
      DEM_4_87    ='FOURTH QUARTER FY87 DEMAND               '
      DEM_1_88    ='FIRST QUARTER FY88 DEMAND                '
      DEM_2_88    ='SECOND QUARTER FY88 DEMAND               '
      DEM_3_88    ='THIRD QUARTER FY88 DEMAND                '
      DEM_4_88    ='FOURTH QUARTER FY88 DEMAND               '
      DEM_1_89    ='FIRST QUARTER FY89 DEMAND                '
      AMC         ='ACQUISITION METHOD CODE                  '
      AMSC        ='ACQUISITION METHOD SUFFIX CODE           '
      PUR_QTY     ='PURCHASE QUANTITY                        '
      UNIT_PRI    ='UNIT PRICE                               '
      TOT_PRI     ='EXTENDED PRICE                           '
      PALT        ='PROCUREMENT ADMINISTRATIVE LEADTIME      '
      FGC         ='FAMILY GROUP CODE                        '
      FRC         ='FAMILY RELATIONSHIP CODE                 '
      AFSCM       ='SUPPLIER                                 '
      SMRC        ='SUPPLY MANAGEMENT REVIEW CODE            '
      PGMC        ='PGM STATUS CODE                          '
      APC         ='AUTOMATED PURCHASE CODE                  '
      PIIN        ='PRIMARY/SECONDARY ITEM IDENT NUMBER      ';
 DEM_MEAN= MEAN(DEM_1_87,DEM_2_87,DEM_3_87,DEM_4_87,DEM_1_88,DEM_2_88,
          DEM_3_88,DEM_4_88,DEM_1_89);
 DEM_SD= STD(DEM_1_87,DEM_2_87,DEM_3_87,DEM_4_87,DEM_1_88,DEM_2_88,
          DEM_3_88,DEM_4_88,DEM_1_89);
 IF (DEM_MEAN NE 0) THEN COEF_VAR=DEM_SD/DEM_MEAN;
ADJ_PALT=PALT*0.9;
DOLT=45;
IF(ADJ_PALT NE 0) THEN PALT_RED=((ADJ_PALT-DOLT)/ADJ_PALT)*100;
ANN_DEM=DEM_MEAN*4;
ANN_RQT=ANN_DEM*UNIT_PRI;
DATA DATA1 DATA2 DATA3 DATA4;
 SET IDTC;
 IF AMSC NE 'Y';
 IF 25000<ANN_RQT<100000;
 IF DEM_MEAN NE 0;
 IF COEF_VAR<=0.75;
 IF ADJ_PALT>150;
 CHAR3 = SUBSTR(NIIN,1,3);
   IF 'LLA'<=CHAR3<='002' THEN OUTPUT DATA1;
   IF '003'<=CHAR3<='008' THEN OUTPUT DATA2;
   IF '009'<=CHAR3<='010' THEN OUTPUT DATA3;
   IF '011'<=CHAR3<='998' THEN OUTPUT DATA4;
```

```
PROC SUMMARY DATA=DATA1;
   CLASS NIIN;
   VAR COEF_VAR ANN_DEM;
   OUTPUT OUT=NIINGRP1 MEAN=MCOEF_VA MANN_DEM;
 PROC SUMMARY DATA=DATA2;
    CLASS NIIN;
    VAR COEF_VAR ANN_DEM;
    OUTPUT OUT=NIINGRP2 MEAN=MCOEF_VA MANN_DEM;
 PROC SUMMARY DATA=DATA3;
    CLASS NIIN;
     VAR COEF_VAR ANN_DEM;
    OUTPUT OUT=NIINGRP3 MEAN=MCOEF_VA MANN_DEM;
 PROC SUMMARY DATA=DATA4;
     CLASS NIIN;
     VAR COEF_VAR ANN_DEM;
     OUTPUT OUT=NIINGRP4 MEAN=MCOEF_VA MANN_DEM;
 DATA NIINGRP;
 SET NIINGRP1 NIINGRP2 NIINGRP3 NIINGRP4;
 PROC SORT;
  BY NIIN;
 DATA FAMILY;
    MERGE IDTC NIINGRP (IN=A);
    BY NIIN;
    IF A;
 PROC SORT;
    BY AFSCM ITEM;
  DATA SORTED;
   SET FAMILY;
 PROC PRINT;
 VAR
    NIIN
    ITEM
    DFSCM
    REFNUM
    DEM_MEAN
    ANN_DEM
    UNIT_PRI
    ANN_RQT
    AMC
    AFSCM
    ADJ_PALT;
/*
```

NIIN	ITEM	DFSCM	REFNUM	DEM_MEAN	ANN_DEM	UNIT_PRI	ANN_RQT	AMC	AFSCM	ADJ_PALT
008689197	FOLLOWER ASSY,VALVE		BYLB248	5.78	23.11	4922	113753	3	73030	423.9
008689197	FOLLOWER ASSY,VALVE		BYLB248	5.78	23.11	4922	113753	3	73030	423.9
008689197	FOLLOWER ASSY,VALVE		BYLB248	5.78	23.11	3138	72523	3	73030	423.9
008689197	FOLLOWER ASSY,VALVE		BYLB248	5.78	23.11	3138	72523	3	73030	423.9
008689197	FOLLOWER ASSY,VALVE		BYLB248	5.78	23.11	3138	72523	3	73030	423.9
001359572	GASKET		G1M27C68	86.67	346.67	350	121333	3	73030	468.9
001359572	GASKET		G1M27C68	86.67	346.67	350	121333	3	73030	468.9
001359572	GASKET		G1M27C68	86.67	346.67	350	121333	3	73030	468.9
001359572	GASKET		G1M27C68	86.67	346.67	275	95333	3	73030	468.9
001359572	GASKET		G1M27C68	86.67	346.67	275	95333	3	73030	468.9
001359572	GASKET		G1M27C68	86.67	346.67	275	95333	3	73030	468.9
008950957	GASKET	52661	366468REVA	89.44	357.78	113	40429	3	73030	522.9
008950957	GASKET	52661	366468REVA	89.44	357.78	113	40429	3	73030	522.9
008950957	GASKET	52661	366468REVA	89.44	357.78	113	40429	3	73030	522.9
008950957	GASKET	52661	366468REVA	89.44	357.78	113	40429	3	73030	522.9
008950957	GASKET	52661	366468REVA	89.44	357.78	113	40429	3	73030	522.9
008950957	GASKET	52661	366468REVA	89.44	357.78	113	40429	3	73030	522.9
008950957	GASKET		366468	89.44	357.78	115	41144	3	73030	522.9
008950957	GASKET		366468	89.44	357.78	115	41144	3	73030	522.9
008950957	GASKET		366468	89.44	357.78	115	41144	3	73030	522.9
008950957	GASKET		366468	89.44	357.78	115	41144	3	73030	522.9
008950957	GASKET		366468	89.44	357.78	115	41144	3	73030	522.9
008950957	GASKET		366468	89.44	357.78	115	41144	3	73030	522.9
008950957	GASKET		366468	89.44	357.78	115	41144	3	73030	522.9
008396850	GASKET,IGNITER PLUG	00196	3010880	1137.67	4550.67	21	95564	3	73030	450.9
008396850	GASKET,IGNITER PLUG	00196	3010880	1137.67	4550.67	21	95564	3	73030	450.9
008396850	GASKET,IGNITER PLUG	00196	3010880	1137.67	4550.67	21	95564	3	73030	450.9
008396850	GASKET,IGNITER PLUG	00196	3010880	1137.67	4550.67	21	95564	3	73030	450.9
008396850	GASKET,IGNITER PLUG	00196	3010880	1137.67	4550.67	21	95564	3	73030	450.9
008396850	GASKET,IGNITER PLUG	00198	3010880	1137.67	4550.67	21	95564	3	73030	450.9
008396850	GASKET,IGNITER PLUG	00198	3010880	1137.67	4550.67	21	95564	3	73030	450.9
008396850	GASKET,IGNITER PLUG	00198	3010880	1137.67	4550.67	21	95564	3	73030	450.9

Figure 11. Family Group Model Output

APPENDIX H

PALT REDUCTION MODEL

Explanations

Program Steps are the same as the Full Model except that the frequency table variables are DOLT and PALT Reduction.

PROC FORMAT:	Establishes the format for the frequency tables.
PROC FREQ:	Instructs SAS to produce frequency tables.
TABLES:	Instructs SAS to produce a contingency table.
TABLES:	Instructs SAS to produce frequency tables.
FORMAT:	Provides the format for the contingency and frequency tables.
TITLE:	Gives the tables a title.
/*:	Tells SAS that this is the end of the program.

PALT REDUCTION MODEL PROGRAM STEPS

```
DATA IDTC;
INFILE RSP89;
INPUT NIIN      $ 1-9
      ITEM      $ 10-28
      UNIT      $ 29-30
      CODENUM   $ 31
      CODETYPE  $ 32-33
      DFSCM     $ 34-38
      REFNUM    $ 39-58
      DEM_1_87    59-66
      DEM_2_87    67-74
      DEM_3_87    75-82
      DEM_4_87    83-90
      DEM_1_88    91-98
      DEM_2_88    99-106
      DEM_3_88    107-114
      DEM_4_88    115-122
      DEM_1_89    123-130
      AMC       $ 131
      AMSC      $ 132
      PUR_QTY     133-140
      UNIT_PRI    141-149
      TOT_PRI     150-160
      PALT        161-164
      PIIN      $ 165-183
      FGC       $184-187
      FRC       $ 188
      AFSCM     $ 189-193
      SMRC      $ 194
      PGMC      $195-196
      APC       $197;
LABEL
      NIIN        ='NATIONAL ITEM IDENTIFICATION NUMBER    '
      ITEM        ='NOMENCLATURE                           '
      UNIT        ='UNIT OF ISSUE                          '
      CODENUM     ='PROCUREMENT NUMBER CODE                '
      CODETYPE    ='TYPE OF NUMBER CODE                    '
      FSCM        ='FEDERAL SUPPLY CODE FOR MANUFACTURERS  '
      REFNUM      ='REFERENCE NUMBER                       '
      DEM_1_87    ='FIRST QUARTER FY87 DEMAND              '
      DEM_2_87    ='SECOND QUARTER FY87 DEMAND             '
      DEM_3_87    ='THIRD QUARTER FY87 DEMAND              '
      DEM_4_87    ='FOURTH QUARTER FY87 DEMAND             '
      DEM_1_88    ='FIRST QUARTER FY88 DEMAND              '
      DEM_2_88    ='SECOND QUARTER FY88 DEMAND             '
      DEM_3_88    ='THIRD QUARTER FY88 DEMAND              '
      DEM_4_88    ='FOURTH QUARTER FY88 DEMAND             '
      DEM_1_89    ='FIRST QUARTER FY89 DEMAND              '
```

```
      AMC         ='ACQUISITION METHOD CODE                   '
      AMSC        ='ACQUISITION METHOD SUFFIX CODE            '
      PUR_QTY     ='PURCHASE QUANTITY                         '
      UNIT_PRI    ='UNIT PRICE                                '
      TOT_PRI     ='EXTENDED PRICE                            '
      PALT        ='PROCUREMENT ADMINISTRATIVE LEADTIME       '
      FGC         ='FAMILY GROUP CODE                         '
      FRC         ='FAMILY RELATIONSHIP CODE                  '
      AFSCM       ='SUPPLIER                                  '
      SMRC        ='SUPPLY MANAGEMENT REVIEW CODE             '
      PGMC        ='PGM STATUS CODE                           '
      APC         ='AUTOMATED PURCHASE CODE                   '
      PIIN        ='PRIMARY/SECONDARY ITEM IDENT NUMBER       ';
DEM_MEAN= MEAN(DEM_1_87,DEM_2_87,DEM_3_87,DEM_4_87,DEM_1_88,DEM_2_88,
          DEM_3_88,DEM_4_88,DEM_1_89);
DEM_SD= STD(DEM_1_87,DEM_2_87,DEM_3_87,DEM_4_87,DEM_1_88,DEM_2_88,
          DEM_3_88,DEM_4_88,DEM_1_89);
IF (DEM_MEAN NE 0) THEN COEF_VAR=DEM_SD/DEM_MEAN;
 DOLT=45;
 ADJ_PALT=PALT*0.9;
 IF(ADJ_PALT NE 0) THEN PALT_RED=((ADJ_PALT-DOLT)/ADJ_PALT)*100;
 ANN_DEM=DEM_MEAN*4;
 ANN_RQT=ANN_DEM*UNIT_PRI;
 DATA DATA1 DATA2 DATA3 DATA4;
  SET IDTC;
  IF AMSC NE 'Y';
  IF ANN_RQT>=100000;
  IF DEM_MEAN NE 0;
  IF COEF_VAR LE 0.75;
  IF ADJ_PALT>150;
  CHAR3 = SUBSTR(NIIN,1,3);
    IF 'LLA'<=CHAR3<='002' THEN OUTPUT DATA1;
    IF '003'<=CHAR3<='008' THEN OUTPUT DATA2;
    IF '009'<=CHAR3<='010' THEN OUTPUT DATA3;
    IF '011'<=CHAR3<='998' THEN OUTPUT DATA4;
  PROC SUMMARY DATA=DATA1;
     CLASS NIIN;
     VAR DOLT PALT_RED;
     OUTPUT OUT=NIINGRP1 MEAN=MDOLT MPALT_RE;
   PROC SUMMARY DATA=DATA2;
      CLASS NIIN;
      VAR DOLT PALT_RED;
      OUTPUT OUT=NIINGRP2 MEAN=MDOLT MPALT_RE;
   PROC SUMMARY DATA=DATA3;
      CLASS NIIN;
       VAR DOLT PALT_RED;
      OUTPUT OUT=NIINGRP3 MEAN=MDOLT MPALT_RE;
   PROC SUMMARY DATA=DATA4;
       CLASS NIIN;
       VAR DOLT PALT_RED;
       OUTPUT OUT=NIINGRP4 MEAN=MDOLT MPALT_RE;
```

```
DATA NIINGRP;
SET NIINGRP1 NIINGRP2 NIINGRP3 NIINGRP4;
PROC FORMAT;
  VALUE DT 45='45';
VALUE PR      0 - <10 = '0 -  9'
             10 - <20 = '10 - 19'
             20 - <30 = '20 - 29'
             30 - <40 = '30 - 39'
             40 - <50 = '40 - 49'
             50 - <60 = '50 - 59'
             60 - <70 = '60 - 69'
             70 - <80 = '70 - 79'
             80 - <90 = '80 - 89'
             90 - <101= '90 - 100';
PROC FREQ;
  TABLES MDOLT * MPALT_RE;
  TABLES MPALT_RE MDOLT;
FORMAT MDOLT DT. MPALT_RE PR.;
TITLE 'SPEIGHTS IDTC CANDIDATE DETERMINATION MODEL' ;
 /*
```

TABLE X

COMPARISON OF DOLT VERSUS PALT REDUCTION (PR)

	PALT REDUCTION RANGES									
DOLT	0-9	10-19	20-29	30-39	40-49	50-59	60-69	70-79	80-89	90-100
15	0	0	0	0	0	0	0	0	0	2,696
30	0	0	0	0	0	0	0	0	67	2,629
45	0	0	0	0	0	0	0	9	595	2,092
60	0	0	0	0	0	0	2	65	1,401	1,228
90	0	0	0	0	1	8	58	537	1,881	211
120	0	0	1	1	9	56	278	1,123	1,208	20
150	1	0	5	8	53	198	633	1,250	548	0

Source: Developed by Author

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